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Vol. 25 JULY, 1944 No. 1

THE JOURNAL OF PEDIATRICS

A MONTHLY JOURNAL DEVOTED TO THE PROBLEMS AND DISEASES OF INFANCY AND CHILDHOOD

Official Organ for
THE AMERICAN ACADEMY OF PEDIATRICS

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A breakfast consisting of fruit, cereal, a reasonable amount of sugar, milk, and bread and butter, is widely recommended by nutritionists as an excellent morning meal for children. Such a breakfast makes a notable contribution of virtually every required nutrient, and is calorically adequate in most instances.

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	Recommended Daily Allowances of Child 4-6	Supplied by Dish of Cereal, Milk, and Sugar	Percentage of Daily Allowances
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Iron	8 mg.	1.29 mg.	16.2%
Vitamin A	2500 I.U.	187 I.U.	7.5%
Thiamine	0.8 mg.	0.18 mg.	22.1%
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Niacin	8 mg.	0.64 mg.	10.5%

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Various Journals

The Journal of Pediatrics

VOL. 25 JULY, 1944 NO. 1

Original Communications

TIBIAL BONE MARROW INFUSIONS IN INFANCY

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ONE of the great advances in pediatric therapy in recent years has been the wider use of intravenous infusions of water, mineral salts, blood or plasma, and drugs. The development of a technique of continuous drip intravenous infusion by the method of cutting down on a vein has stimulated this advance, but in infancy the procedure is not always easy, and not infrequently in those critically ill available veins are soon exhausted.

There is definite need of a quick, easy, harmless method for rapid absorption of physiologic solutions, plasma, blood, and medicaments.

Bone marrow infusion has been recognized therapeutically only recently. Tocantins[1-4] has probably done more to popularize it than anyone else. The war gave it added stimulus since shock with its peripheral vascular collapse and burns with large denuded areas made the use of plasma of prime importance and the problem of intravenous transfusion difficult.

That substances injected into bone marrow are absorbed as rapidly as through intravenous routes has been proved conclusively by Macht[5] in experimental animals and by Tocantins in infants. We have demonstrated the rapid diffusion of diodrast throughout the entire length of the tibia. Some of the diodrast was seen to leave the tibia at about the site of the nutrient foramen. In the cadaver various dyes and radiopaque substances injected into bone marrow may be found in the venous system.

Most of the work on bone marrow infusions has been done on adults, and all the work in adults has been done on the sternum. Tocantins and associates[3] reported the transfusion of eleven infants by tibia and femur with fourteen successes and fifteen failures out of twenty-nine attempts. They pointed out that when failure occurred on the first attempt further

From the Children's Division of The Cook County Hospital, and the Department of Pediatrics, Loyola University School of Medicine.

attempts on the same patient were also unsuccessful. They suggested the presence of an unusually dense medullary cavity as the cause of some failures. In their series of bone x-rays taken immediately after the needle was removed and three weeks later a small orifice at the site of puncture was present. After six months there was no evidence of a previous puncture. They found the average rate of infusion for the sternum usually faster than in the tibia. Their results for the sternum ranged from 0.4 c.c. to 25 c.c. per minute. Papper and Rovenstine[6] stated that the speed of intrasternal transfusion in their series varied from 2.5 c.c. to 10.3 c.c. per minute. The average rate of flow in Tocantins' intratibial series was 1.7 c.c. per minute.

TECHNIQUE

With the exception of one instance all cases in our series were intratibial, using a needle set designed by Dr. Harry Turkel. It consists of four parts, an outer needle with a stylet and an inner hollow drill with an oversize stylet. The set comes in two sizes, a three inch outer needle and a one inch outer needle. Both lengths are fifteen guage in diameter.

The equipment necessary for an infusion consists of a sterile tray (Fig. 1.) containing a bone marrow needle set, a hypodermic syringe, a 10 or 20 c.c. syringe, dressings, one medicine glass with 1 per cent procaine, one medicine glass with normal saline, two towels, and scissors; sterile gloves, a padded foot board, and adhesive tape are also required. The leg is taped to the board which is fastened firmly in place. The tape should be about one inch wide and should be long enough so that it will extend completely around the leg and the board. One piece of tape is placed just above the ankle with the toes pointing straight up. Another strip of tape is placed across the patella. The skin over the upper half of the tibia is surgically prepared with antiseptic solution and sterile towels are used to drape the field. The anterior margin of the tibia is palpated upward until the metaphysis is reached. At this point the sharp margin ends and a triangular shaped eminence, the tibial tuberosity, may be palpated. If the operator is right-handed, the tibia is grasped between the forefinger and thumb of the left hand at this level, and a superficial skin wheal with procaine is made between the two fingers in the midline. Then a running infiltration down to the periosteum is made. The outer needle with the stylet in place is inserted through the skin at a seventy to eighty degree angle beneath the periosteum with the bevel down so that the bevel lies almost parallel to the tibia and the needle points distally in order to avoid the epiphyseal plate. The stylet is removed and the hollow drill with its stylet is inserted within the outer needle. While holding the head of the outer needle with the fingers of the left hand, the head of the inner drill is turned to and fro with the fingers

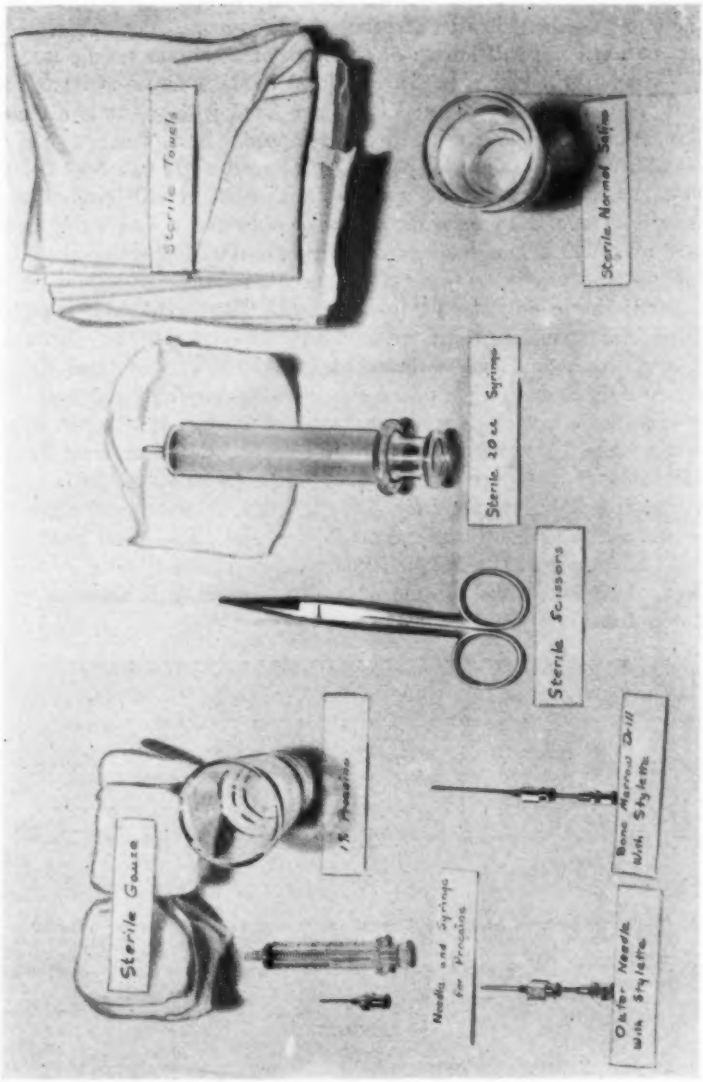

Fig. 1.—Sterile tray for bone marrow infusion.

of the right hand, at the same time exerting firm downward pressure. A sudden release of resistance signifies the entrance of the drill into the medullary cavity. The drilling action with slight pressure should continue until the neck of the inner drill is completely within the head of the outer needle. The outer needle is then pushed downward about 6 mm. or until the full length of the neck of the inner needle may be seen. The outer needle is now firmly fixed in the marrow cavity. Then the inner needle is removed and a syringe filled with saline is attached to the outer needle and aspiration attempted. Bone marrow will be obtained if one has done the procedure correctly. If one does not get bone marrow return in the syringe, the infusion will probably be a failure. Once bone marrow has been obtained a few cubic centimeters of saline are injected to clear the needle. The saline should go in easily. One may be certain that the needle is in the medullary cavity if the following conditions are present: (1) The needle feels firmly in position and stands upright without any support, (2) on aspiration with a syringe bone marrow flows back into the syringe, and (3) on injection fluid flows freely and no subcutaneous swelling appears. For slow drip the flask with its rubber tubing and adapter is attached, otherwise a syringe may be used for rapid injection. No time must be lost in attaching the adapter and in changing flasks since the intramedullary pressure which ranges from 40 to 195 mm. of water will cause the bone marrow to back up into the needle and clot. One must make sure that all air is out of the infusion system since this may be a cause for failure. The total time consumed in this procedure is from three to five minutes.

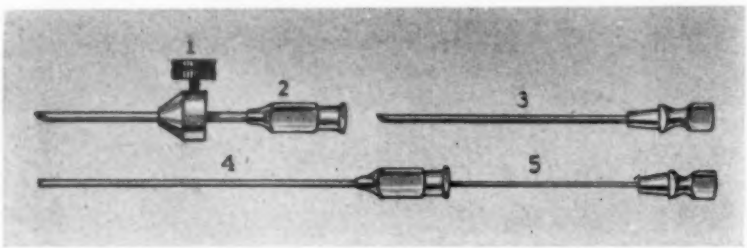

Fig. 2.—Bone marrow needle and drill. *1*, Guard on bone needle, adjustable so that effective length of needle shaft may be varied. *2*, Needle. *3*, Stylet for needle, bevelled end flush with tip of needle. *4*, Note notched edge. *5*, Stylet for drill, when completely inserted tip of stylet extends beyond tip of drill to expel fragments of bone from lumen.

RESULTS

Up to Jan. 9, 1944, forty-three bone marrow infusions were attempted in thirty-four patients with a total of thirty-five successes, six failures, and two partial failures, or about 81 per cent complete successes. A résumé of these cases is shown in Table I. Of the thirty-four patients, thirty (88 per cent) were successfully transfused. Three attempts on

TABLE I

RÉSUMÉ OF THE THIRTY-FOUR PATIENTS INFUSED

CASE	AGE	SEX	CLINICAL DIAGNOSIS	FLUID	AMOUNT (C.C.)	TIME
1	5 wk.	M.	Pneumococcus meningitis	100,000 units antiserum	50 normal saline	—
2	7 mo.	M.	Eczema	D and S	200	55 min.
				D and S	150	60 min.
				D and S	200	65 min.
3	6 mo.	F.	URI dehydration	D and S	200	80 min.
				D and S	200	65 min.
				D and S	200	100 min.
				Plasma	200	3 hr.,
				D and S	100	35 min.
4[a]	3 mo.	M.	Pneumonia	Whole blood	100 of 150	[b]
5	11 mo.	M.		D and S	200	60 min.
6[c]	2 days	M.	Congenital atresia of intestine	Plasma	60	1 hr., 40 min.
				D and S	70	
				D and S	100	
7	9 days	M.	Diarrhea	Plasma	70	
				Hartman's	75	
8	5 mo.	M.	Diarrhea	Plasma	70	
9[d]	7 mo.	F.	Pneumococcus meningitis	Plasma	100	Stopped after 30 c.c.
10	10 wk.	M.	Diarrhea	Plasma	100	60 min.
11	7 mo.	F.	Meningitis	Blood	50	1 hr., 20 min.
				5% dextrose	150	
12	3 mo.	F.	Laryngotracheitis (diphtheria)	Plasma	60	20 min.
				5% dextrose	100	60 min.
				Antitoxin (diphtheria)	50	45 min.
				Whole blood	80	40 min.
				5% dextrose	100	
13	3 mo.	M.	Pneumonia	D and S	80	20 min.
			Shock	Plasma	80	55 min.
14	5 mo.	M.	Tuberculous meningitis	D and S	150	30 min.
				Plasma	70	30 min.
15	9 mo.	M.	Pneumonia	D and S	200	150 min.
				D and S	150	—
16[e]	2½ yr.	F.	Shock and dehydration	Sulfamerazine (22½ gr. in saline)	100	20 min.
			Cyanosis			75 c.c. in 60 min.
				Plasma	200	
17	25 days	F.	Diarrhea	Diluted blood	120	3 hr., 25 min.

[a] See text under Results.
[b] See text under Results.
[c] Died; multiple atresias, unable to relieve obstruction.
[d] Failure.
[e] Died during infusion; autopsy showed purulent bronchitis, no heart failure.
[f] Only 250 c.c. ran in and then stopped, partial failure.
[g] Needle styletted; attempt to restart in P.M. unsuccessful.
[h] Failure; unsuccessful; failed to aspirate bone marrow.

TABLE I—CONT'D

CASE	AGE	SEX	CLINICAL DIAGNOSIS	FLUID	AMOUNT (C.C.)	TIME
18	4 wk.	M.	Pyloric Stenosis	Plasma	70	20 min.
				D and S	100	60 min.
			Postoperative	Diluted blood	200	3 hr., 15 min.
			Postoperative	D and S	150	60 min.
19	10 mo.	F.	U.R.I. with hyperpyrexia	D and S	200	65 min.
			Hypocalcemia	5% calcium gluconate	100	70 min.
				D and S	100	
20[c]	3 yr.	M.	Sickle cell anemia	Whole blood	300	11 hr.
21	7 mo.	F.	Dehydration and acidosis	Plasma	150	115 min.
				D and S	80	175 min.
22[a]			Influenzal meningitis	100 mg. influenza serum in saline	100	14 min.
23[b]	1 mo.	M.	Syphilis with anemia			
24	10 mo.	M.	U.R.I. dehydration	Plasma	150	115 min.
				5% dextrose	150	90 min.
25	6 mo.	F.	Pneumonia	Plasma	200	55 min.
				D and S	150	30 min.
				5% dextrose	200	75 min.
26	6 mo.	M.	U.R.I. dehydration	D and S	200	45 min.
				D and S	200	120 min.
27	3 mo.	M.	Bronchopneumonia	Plasma	125	25 min.
				D and S	100	35 min.
				Diluted blood	200	40 min.
				5% dextrose	100	
				Plasma	70	180 min.
				5% dextrose	150	115 min.
28	7 mo.	F.	Pneumonia	5% dextrose	80	30 min.
				Plasma	150	180 min.
29	8 mo.	M.	Anemia	Diluted blood	150	165 min.
30	1 mo.	F.	Meningitis	Saline	100	105 min.
				Sulfamerazine	2 Gm.	
				Plasma	100	10 min.
31	4 mo.	M.	Pneumonia	Saline	500	11 hr.
			Severe dehydration Collapse	Sodium sulfathiazol	1 Gm.	
				Plasma	100	
				5% dextrose	200	
32	2 mo.	F.	Shock dehydration	Plasma	100	35 min.
				Saline and sodium sulfamerazine	100 7½ Gm.	35 min.
33	4 mo.	M.	Diarrhea	Plasma	100	30 min.
				D and S	100	30 min.
34	5 mo.	F.	Pneumonia Shock	Plasma	100	30 min.
				10% dextrose	50	25 min.

one patient, two in the tibia and one in the femur, were unsuccessful. In all three attempts bone marrow could not be aspirated. This patient had syphilitic osteochondritis. Autopsy revealed a yellow, avascular, pathologic bone marrow. Two attempts met with failure in another patient with exceedingly fat legs in which it was difficult to palpate the landmarks. The third failure was for a similar reason, and in this infant an attempt in the other tibia with a whole blood transfusion was only partially successful, since only 100 c.c. of 150 c.c. ran in over a period of thirteen hours. The other partial failure was in a 3-year-old Negro male in whom 250 c.c. of whole blood ran through in about eleven hours. The infusion was started with saline which ran well, but when blood was added the infusion gradually slowed up, with temporary increases in rate on squeezing the tubing or forcing a syringe full of saline through the needle. The forceful injection of fluids into bone marrow is always painful while during infusion by the drip method all the patients fell asleep. On the basis of the latter two experiences with whole blood it is felt that only diluted blood should be used in tibial infusions.

The infusion fluids used were saline, dextrose, Hartmann's, sulfonamides, diphtheria antiserum, pneumococcus and influenza bacillus antiserum, plasma, and blood.

In the successful cases the average rate of flow for aqueous solutions was 2.3 c.c. per minute or 138 c.c. per hour with variations from 1 c.c. to 5 c.c. per minute. For plasma the average rate was 1.44 c.c. per minute with variations from .87 c.c. per minute to 3.5 c.c. per minute, and for blood the average was .88 c.c. per minute with variations from .60 c.c. per minute to 2 c.c. per minute. With increasing density the rate of flow decreases.

In no cases were there any ill effects noted. There was no evidence of infection. A great many of the patients were on sulfonamide therapy at the time of infusion. Whether that had any effect on the absence of infections remains to be seen. There are no reports in the literature of infection although the possibility is admitted. Certainly bone marrow infusions should not be done in cases of osteomyelitis or pyogenic septicemias.

With one exception the patients were infants under 1 year (Table II). Our youngest patient was 2 days old and our oldest, 3 years old. This

TABLE II

AGE DISTRIBUTION

AGE GROUP	NUMBER
Birth to 1 mo.	5
1 to 3 mo.	5
3 to 6 mo.	9
6 to 9 mo.	11
9 to 12 mo.	4
Over 1 yr.	1

Fig. 3.—Bone marrow needle in place twenty-four hours. (Patient L. W.)

Fig. 4.—Fourteen hours after removal of needle. Note round defect near proximal metaphysis.

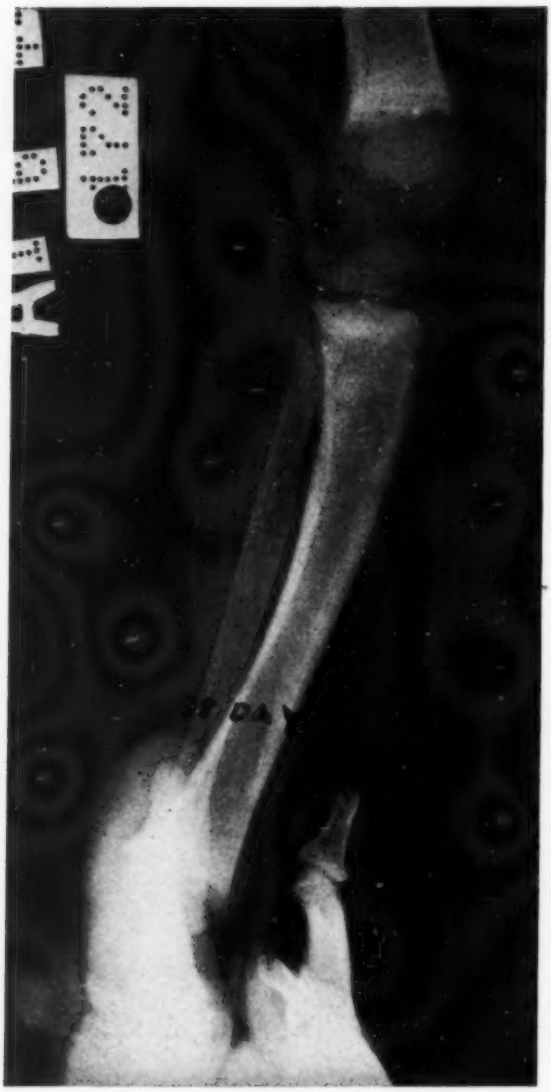

Fig. 5.—L. W. thirty-eight days after removal of bone marrow needle. Faint defect at puncture site persists.

Fig. 6.—A.B. Evidence of subperiosteal bone formation after thirty-three days.

3-year-old was one of our partial failures. Since we know that in adults the tibial bone marrow is yellow, perhaps the bone marrow of a 3-year-old is not as vascular as in the younger child. Tocantins feels that it is safe to do a sternal transfusion in a 3-year-old if the procedure is carried out carefully. Various members of our staff have done sternal transfusions in the past on older children with good results.

Needles have been left in place as long as four days and have functioned for as long as three days. The needle was styletted each time after use. The following day the needle was syringed out with saline, and the adapter from the infusion flask connected.

Periodic x-ray pictures have been taken for only a short period of time since this project is but newly begun (Fig. 3). After removal of the needle a round defect in the bone is visible on x-ray (Fig. 4). After about six weeks this defect from the needle is still faintly visible (Fig. 5). In one case in which there was induration about the puncture site after the needle was removed, on the thirty-third day there was evidence of periosteal elevation and subperiosteal bone formation (Fig. 6). This was probably due to bleeding through the hole made in the bone and might have been prevented through the application of a pressure bandage after the needle was removed.

SUMMARY

A technique of tibial bone marrow infusion is presented. In forty-three attempts in thirty-four young children there were six failures and two partial failures. X-ray studies following infusion were made on some of these, and while small bone defects were observed, and in one instance periosteal elevation with new bone formation, no other deleterious effects were encountered. The only contraindications ascertained from this study are osteomyelitis and pyogenic septicemia on theoretical grounds and syphilitic osteochondritis. This technique merits further investigation especially in children's hospitals where the great need for a simple and rapid method of infusion into the vascular system exists.

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BONE MARROW INFUSIONS AS A ROUTINE PROCEDURE IN CHILDREN

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SINCE the experimental and clinical reports of Tocantins on bone marrow infusions and application in pediatrics,[1-4] very little has appeared on this subject other than further reports by Tocantins and his associates.[5-7] At the Children's Hospital of Akron, bone marrow infusions were initiated the late part of 1941 and early 1942. The method gained rapid favor with the staff and has been used routinely since for infusions in infants and children of 2 years of age and less. In children between the ages of 2 and 5 years this route is also used, but less so because of the frequent presence of good veins which may be exposed surgically. This report represents a review of our clinical experience with this method of infusions in infants and small children.

MATERIAL

This article reviews the cases at this hospital in 1943 in which the patients received infusions via bone marrow during their hospital stay. The majority are within 2 years of age because in this age group we invariably give infusions in this manner. A small number are in the 2- to 5-year age group because the physician has a choice of route for giving fluids easily. The bone marrow infusions here reviewed have all been done by the intern and resident house staff. The majority have been done by the intern staff. We find that after a demonstration or two, with explanations, the method is rapidly grasped.

TECHNIQUE

The technical procedure has been described on numerous occasions.[3, 4, 7] Briefly, our own routine is this. The patient, usually an infant or small child, is strapped to a board with adhesive at the ankle and knee. Protection is given these parts by cotton padding. The region of the tibia or femur to be used is scrubbed with soap and water and painted with tincture of merthiolate. The operator dons mask, gown, and sterile gloves. We use a sterile pack containing one small drape sheet, two towels, four gauze squares, one medicine glass, one 500 c.c. beaker, one gauze filter, one 5 c.c. syringe, one 10 c.c. syringe, one 20 c.c. syringe, and one needle for bone marrow. Our favorite is the 1.5-inch, 18-gauge Kalinski salvarsan needle. For older children between 2 and 5 years we find the B-D Special Needle No. 458 L N R, gauge 16, very good. Other types of needles have proved unsatisfactory.

Saline is put into the medicine glass. The filter is for blood or plasma. The operator drapes the chosen tibia or femur and locates his landmarks. The flat tibial surface one or two fingers below the tibial tuberosity or the lower third of the femur is the usual place chosen as the spot of puncture. Over this spot he places his needle and by a quick jab penetrates the skin. Then by a straight steady push or a rotary twist, he pushes the needle through the bone till he feels it drop. We have not attempted the procedure on any child over 5 years of age. The sternum has never been used as a site of puncture because it is too thin for the purpose. Feeling the needle in the marrow cavity, the operator applies a 5 c.c. syringe filled with a little saline and draws the plunger back. The return of marrow is proof positive that the needle is properly placed. Then by means of a larger syringe, the operator proceeds to inject the infusion fluid through the needle by using gentle pressure and slow rate of infusion.

INDICATIONS

We use this procedure in elective cases as well as urgent emergency cases in the age groups specified. In some types of cases the method has been of inestimable value because of the ease and expediency it offers. Among such cases are those of infectious diarrhea of the newborn infant, dehydration, acidosis, and vomiting. Postoperative cases of intussusception and pylorospasm are greatly aided by fluids given in this manner when the patient goes into collapse or when the course is not smooth. Patients with pneumonia in convulsions and shock show immediate benefit to plasma given in this manner. Among other types may be listed cases of nephritis, nephrosis, extensive burn cases with little skin surface left for administering fluids, and blood dyscrasias of infants and children.

RESULTS

For the year 1943 a total of 144 patients received infusions via bone marrow. Of these, 107 are still alive. The entire group received a total of 326 infusions. Of the entire group, six were over 2 years of age and 138 cases were of 2 years or less. The youngest was 7 hours and the oldest was 4 years. In no case was there failure to give the infusion by this method. In four cases of erythroblastosis the procedure was definitely more difficult.

Of the thirty-seven who died, the cause was as follows: infectious diarrhea of the newborn infant, 12; pneumonia, 8; erythroblastosis, 4; sepsis, 2; brain tumor, 1; hydrocephalus with meningocele, 1; nephrosis, 1; cerebral hemorrhage, 1; pneumococcic meningitis, 1; miliary tuberculosis with meningitis, 1; multiple congenital anomalies, 1; multiple burns, 1; intussusception (operated), 1; intestinal obstruction, 1; agranulocytosis, 1.

REACTIONS AND COMPLICATIONS

In this group of infusions there was but one reaction and one complication which we do not feel were caused by the technique or the routine bone marrow procedure described.

The first case, postpneumonic (Hospital No. 46318), is a 10-month-old male child admitted for severe anemia and agranulocytosis following three weeks of sulfadiazine treatment in the home. The patient, after typing and cross-matching, received 200 c.c. of citrated whole blood via bone marrow. Following the transfusion, the patient developed a rising temperature, rapidly failed, and died six hours later with temperature of 105° F. Autopsy revealed pneumonia and agranulocytosis. We feel this was a transfusion reaction and that it does not incriminate the route by which the transfusion was given.

The second case (Hospital No. 47139) is a 6-week-old female child admitted for severe diarrhea, dehydration, and acidosis. Infusion of 50 c.c. of plasma followed by 50 c.c. of 10 per cent glucose was given in routine manner into the right tibia without difficulty. One-half hour later the entire foot had become black and this extended one-third up the leg to a sharp line of demarcation. This line of demarcation was about two inches below the point of entry of the infusion needle. At the time, opinion was that an arterial thrombus had formed in one of the main vessels of the leg or that the adhesive strapping on the foot and ankle had been too tight and caused damage to superficial vessels, followed by thrombosis. The other foot remained normal. We have not been able to explain how the bone marrow puncture itself could have caused this pathology. The child made an uneventful recovery and the leg restored itself except for the loss of the great and middle toes.

A common finding after bone marrow infusions is the formation of small indurated areas at the site of injection. These result from fluid escaping from the marrow cavity around the needle during the injection. The fluid accumulates in the soft tissue. Occasionally the operator, particularly the beginner, has not punctured the bone properly.

These localized indurated areas have always absorbed completely and caused no complication. In this group of cases we have suffered no infections, sepsis, or osteomyelitis from the routine use of bone marrow infusions.

The infused fluids have consisted of normal saline, 5 per cent glucose, 10 per cent glucose, 20 per cent glucose; 5 per cent sodium sulfadiazine, plasma, citrated whole blood, meningococcic antitoxin; influenzal B serum, and antipneumococcic serum. No untoward reactions have been noted other than the ones mentioned. We are inclined to believe that any fluid which is given into tissues can be given by bone marrow infusion.

CONCLUSIONS

In a series of 326 infusions and a wide variety of infused solutions, only one reaction and one complication have been noted. These are doubted to be a result or directly caused by the bone marrow procedure. This series is notable in that it is the largest recorded to date at the time of this writing and the procedure itself has been applied routinely to infants and small children. As such we feel the procedure is simple, expedient, and easy to master. Refinement comes with a few cases. The procedure should be considered a surgical one and sterile technique used.

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THE TREATMENT OF POLIOMYELITIS

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RECENTLY much controversy has arisen regarding the validity of the Kenny concept of poliomyelitis. The chief end result of the various local controversies so stimulated has been to occasion new thinking regarding poliomyelitis. Certain symptoms, notably that of so-called "muscle spasm," obviously have received too little attention in treatment prior to the present time. That the Kenny hot packs used early in the disease are of great comfort to the patient and apparently result in earlier release of the muscle tension seen in these cases, would recommend their use. Review of treatment over the last two decades apparently indicates that in following closely the tenets of Kendall,[1] overemphasis has been placed on immobilization of patients. "Muscle incoordination," as it occurs in the Kenny concept, is a matter of quibbling with terms.[2] Substitution results in incoordination, but this is not comparable nor of similar origin to what we see in chorea, tabes, and other central nervous system diseases, where incoordination and ataxia are outstanding symptoms. The so-called "spasm" of Sister Kenny[3] is not the spasm seen in upper motor neuron lesions. The explanation of possible causes of this tension is the subject of renewed research investigation.[4, 5] It may be due to meningeal irritation; it may be reflex due to pain; it may be due to involvement of internuncial cells as suggested by Kabot and Knapp;[6] or it may be due to irritation at the neuromuscular synapse, to accumulated toxins of the disease in muscle itself, to dorsal root involvement, or to pyramidal tract involvement. Whatever the cause, the symptom is objective and universally present in some degree in patients with anterior poliomyelitis.

This symptom may be present in other conditions, as choriomeningitis, encephalitis, usually without pain, and to a lesser degree in certain cases of infectious polyneuritis and Guillain-Barré syndrome. Though "muscle spasm" occurs in other conditions, it is universally present in anterior poliomyelitis.

This muscle tightness is diffuse[7] and consistently present in sufficient degree to interfere with passive movement of joints through the normal range through which the particular joint under consideration can normally be moved. Likewise, while this so-called "spasm" is present, if we force passive movement, or when the muscle is under forced tension, we palpate the tendon of the muscle being stretched, we induce pain. When this tenseness, or spasm of muscles, is present in such degree as to

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prevent the examiner from carrying a joint through its normal range of functional movement, it is not surprising that the opposing muscle to the contracted muscle is unable to function at the will of the patient. Such a lack of volitional movement may be judged as evidence of paralysis when in reality it is only dysfunction.

Time spent in consideration of the Kenny treatment has brought a realization that complete and early muscle evaluations prior to the time that the muscle tension is relieved are of limited value. Most medical observers agree that complete muscle evaluations should be tabulated at progressive stages of the disease. To be of maximum value these evaluations should be considered along with electrical determinations for more definite findings as to the physiologic conditions of the motor reflex[8] at various times while the case is under observation.

Since we have been trying to evaluate this symptom of muscle tightness associated or unassociated with muscle weakness, we find we have a considerable number of cases in any anterior poliomyelitis epidemic which simulate poliomyelitis but which have to be carefully excluded. Often such exclusion can be made only by repeated spinal fluid examinations, repeated physical examinations, and progressive study of electrical reactions. I have already mentioned the diseases in question.

These are the considerations which seem necessary before discussing the actual treatment of the patient. The treatment mentioned herewith is the author's present idea of what seems to offer the patient a maximum in function as the end result. The treatment likewise is based upon certain economical considerations which must be considered in institutional treatment. The treatment outlined departs from any and all stereotyped methods of treatment, but draws from all available sources anything which would seem to be practical and of benefit to the patient.

The treatment, for convenience, will be divided into four stages:

1. *Expectant or Acute Stage.*—During the expectant or acute stage most attention will be directed toward determining the primary diagnosis,[9] localization, and gravity of the symptoms. The treatment will be largely symptomatic and may be lifesaving.

2. *The Subacute Stage.*—In the subacute stage the patient apparently will live and the treatment is directed toward production of symptomatic improvement, preservation of nutrition and strength, and through long range thinking, prevention of impending deformities which might be produced if contractures developed, and also the progressive active improvement of function.

3. *The Convalescent Stage.*—The convalescent stage is marked by progressive muscle re-education, supportive assistance through various nonsurgical orthopedic aids, as wedges, shoes, braces.

4. *The Residual Stage.*—In the residual stage close consideration of available muscle power, stability, and growth problems requires major orthopedic surgical assistance.

These four stages are rather definitely definable in each case, but the duration of each stage may be extremely variable. Our estimated needs as to treatment in any stage must be very realistic and as practical as possible. The cataclysmic nature of the disease definitely makes the prognosis gravest in the expectant stage, and progressively hopeful as time and treatment progress. Symptomatic treatment is the only treatment as yet devised in anterior poliomyelitis. Our aim in treatment is to attain a minimum of fixed deformity in the patient and an optimum of kinesthetic efficiency in the rehabilitated patient.

There is a lack of definiteness present in the early stage, when symptoms of fever, pain, toxemia, and loss of appetite and ambition may be the only findings and may not in themselves seem sufficiently grave to enforce rest, restriction, and observation. In geographical areas where seasonal endemic poliomyelitis occurs, or during epidemics of the disease, any such minor symptoms should be the occasion for enforcement of prophylactic rest and probably precautionary routine. In more suspicious cases spinal puncture should be made and repeated if symptoms persist. The treatment in this stage is symptomatic. The type of involvement and severity of symptoms will determine immediate action.

Nursing care of poliomyelitis patients must include: (1) strict individual precaution, not necessarily confinement to a separate room; (2) in bulbar cases, pharynx kept clear of secretions, postnasal drainage if patient cannot swallow, aspiration if necessary, atropin if indicated, no foods by mouth until all fever is gone and some sign of appetite has reappeared; (3) fluids and carbohydrates sufficient to prevent dehydration and ketosis, to be given parenterally or by rectum; (4) oxygen, if indicated, administered by funnel, open tent, or nasal route; (5) hypertonic glucose solution when indicated; (6) respirator at hand; (7) setup for tracheotomy at hand, if need seems imminent; (8) bed prepared specially (Sister Kenny prepares a flat bed, with foot board cradle to support the covers, blankets to lie on and light blanket immediately in contact with the patient's limbs when no other heating is being given); a minimum of clothing; (9) bolsters or small pillows to relieve muscle strain and give support where needed and prevent stretch reflex irritation; (10) hot fomentations as pain and tension in the muscles indicate. These packs give definite symptomatic improvement and often bring rest and relaxation to the patient when usual doses of opiates have no effect. The undesirable effects of opiates are well dispensed with at this stage when chest râles, difficulty in coughing, intestinal atony, and often depression of vital centers are present. The applications as described by Sister Kenny are one method. Others may be devised or other methods of heating may be more desirable.

There is no consideration of splinting at this time. Our chief interest is diagnosis and particularly immediate prognosis. Repeated spinal drainage may be advantageous.

The chief use of the respirator is in cases with involvement of diaphragm and intercostals, if anoxemia is developing. Hot chest packs continuously applied, reassurance, and instruction in breathing should be attempted before resorting to the respirator. The respirator should not be withheld until deep cyanosis develops. The use of respirator in bulbar cases with medullary involvement is unsatisfactory, and in cases with pharyngeal involvement it presents a hazard of inspiratory pneumonia due to inspiration of secretions.

The treatment of the subacute stage and the convalescent stage belongs purely to the field of physical therapy, whether given by the physical therapy technician or the nurse, or through teamwork of both.

The patient has survived the expectant stage, the parents are now concerned with what the ultimate outcome will be. Any prognosis must be guarded, for too many variables present to make any definite prognosis possible with the one exception of those cases where muscle tightness often generalized and very disabling is present but no definite muscle weaknesses are basically found. In these cases we may say that regardless of treatment all will probably recover in time. Where definite paralysis or weakness is present, regardless of how little, a guarded prognosis for recovery should be the rule. A misspoken word at this time may be the cause of considerable embarrassment later.

In the subacute stage extreme care should be taken to prevent contractures and combat all influences which might contribute to development of deformities. Likewise in this stage, we still have pain to combat; lessened irritation to muscles will shorten the period of disability. The patient is kept flat in bed. Increased tension in neck, back, and hamstring muscles is present early in all cases. Where no tightness is present in either gastrocnemii or solei muscles, it is well to support the feet against a footboard as advocated by Sister Kenny. This footboard likewise makes for convenience to the patient when lying in the prone position. All poliomyelitis patients should be turned in bed several times daily. When such turning is done, it should be done by at least two persons and the patient is most comfortably turned in a position of hyperextension.

While resting in bed the patient should have additional support as needs indicate. For example, if marked tension in hamstrings exists preventing full extension of legs, a bolster or small pad beneath the knees when supine or beneath shins when prone, will decrease painful irritation to the tight muscles. Likewise, with marked lordosis due to tight quadriceps or sartorius muscles, a small pillow under the lumbar spine may be helpful. Small pillows to support the forearm in cases of tight antebrachial muscles; support to outer forearm to relax tight pronators; support beneath tip of shoulder where pectorals are tight; sandbag or blanket support of lateral side of leg when the foot is in varus; the use of heavy sandbag above the shoulder to gently overcome increased spasm in upper trapezius; all these have proved helpful.

My experience has prompted the occasional use of posterior moulded shells to support the foot in dorsiflexion, and to be worn at all times except during the period when hot packs are being actively applied. This is contrary to the teaching of Sister Kenny, but it has been observed that in certain cases where tension of gastrocnemii or solei has been persistent in the face of constant application of hot packs, splinting affords assurance against the occurrence of contracture in the extensor calf muscles. This is particularly true in cases where permanent paralysis of the anterior tibial and peroneals seems probable. Likewise, in deltoid and trapezius paralysis, the early use of a sling to support the shoulder as soon as the patient is placed in upright or semiupright position seems advisable. If the patient has definite paralysis of these muscles, abduction splinting of shoulder on ambulation seems good therapy.

In the subacute stage, hot packs applied by the method taught by Sister Kenny are effective. These packs seem to hasten relaxation of tension. Given by the method advocated, they bring more warmth to the muscles than has usually been advised in previous plans for treatment. This warmth tends to maintain the nutrition to skin and muscles, to relieve any pain residual in the muscle, and serves as a psychologic aid in keeping the otherwise unrestricted patient subdued. There are several matters in the technique of giving these packs which I would stress. In considering the need for the location of packs, patients should be examined after a period of some hours when no packs have been applied. Warm muscles on examination may not show the restrictive tension for which the packs are applied.

1. Packs must be applied as hot as skin of patient will tolerate.
2. Packs must cover the whole of the muscles being packed.
3. Packs should not be discontinued to any area unless certain that the need is no longer present. I find it very discouraging to patients to have packs discontinued and later have to reapply them to any area.
4. It is very difficult to discriminate late in this stage whether residual tension is in the low back muscles or muscles of gluteal region and thigh. For this reason, in my cases, I continue both low back and thigh packs until hip and back flexion is at a point where these packs are no longer indicated.

Before proceeding to discuss other treatment, I would say that hot packing of poliomyelitis patients is hard labor, expensive, and presents a difficult economic problem even in a small group of patients. In the earlier weeks of the disease, it brings great comfort and relaxation to the neuromuscular system. Later in the disease, even though there is some tightness in certain muscles, hot packs can be dispensed with as the stretch reflex present in the painful stage is no longer present. Observation has demonstrated that progressive muscle stretching and exercises will result in normal joint and muscle function.

Tendon stimulation by passive movements of a joint and alternate tensing and relaxing of a tendon are helpful in muscle re-education,

through their influence on the proprioceptor reflexes. Such movements must not produce pain and must be made in a progressively increased range.

Muscle re-education must be progressive whether done by the Kenny method or other accepted methods.[9] The establishment of "mental awareness," to use the Kenny term, is nothing new in muscular re-education. Any stimulation to the patient's sensorium, be it visual, tactile, or proprioceptive, which will assist in bringing about volition, should be utilized. Incoordination of muscles which may be either demonstrated as substitution, confusion, or too much synergic effort, must be overcome. Too much attention must not be paid to active function of the prime mover of a joint, but consideration must be made of the relaxation of antagonists where slack must be paid out if good smooth function is to occur. Too much demand of muscles in the presence of effective tightness of antagonists will result in just the thing which Sister Kenny would avoid, the so-called "mental alienation."

In its broadest sense "mental alienation" is that condition in which the patient finds he cannot move a muscle or a member on demand of his will. The pictured movement, which he would enact, cannot be effected. Paralysis is a very positive type of "mental alienation." Sister Kenny has explained that as a result of the spasm and pain which are present from the onset in poliomyelitis, the patient is inhibited from moving muscles due to the pain or resistance of the tightened muscles. When this inhibition persists the patient becomes consciously unaware of how to move a part and to all purposes acts as though paralyzed. The patient then presents "mental alienation." This may be related to muscles in any part of the body. This term is acceptable if used in this broad sense. Many conditions can bring on this physiologic situation.

In observing the Kenny method in practice, I find that sternomastoid "alienation" is a very rare finding and it is a waste of effort to even fuss with sternomastoids until the tension in the posterior neck passes off. Suffice it to know that sternomastoid action is present and that the muscle can be observed to rotate the resting head. Likewise, too much stress is placed on the action of the sternomastoid in producing anteflexion of the neck and too little attention to the deeper more positive flexors of the neck and head, namely, the longus capitis, rectus capitis anterior.

As soon as the muscle tightness will permit, the patient should be progressively ambulated. Flail joints should be supported with braces consistent with accepted orthopedic practice. Weak muscles should be protected from overstrain by use of light braces. In cases with fair stability, these braces should be discarded for certain periods each day so that muscles may develop through performing their normal function. Fatigue of muscles should be avoided. Excessive effort in

utilizing a heavy brace is one common means of preventing return of muscle power.

At intervals of from two to four weeks or more, in this subacute stage, functional evaluations of muscle strength should be recorded. These records are of inestimable value in practical determination of the treatment and for timing the progressive ambulation of the patient. These muscle evaluations are done less frequently as progress of returning muscle power slows up in the convalescent stage. Whether this is done collectively in functional groups or by individual muscles is a matter of opinion.

Electrical tests, preferably chronaxie evaluations, should be made in muscles whose strength at about four months from onset is still such as not to be able to function against gravity. Such tests should be repeated subsequently at intervals, and are of great assistance in progressive prognosis. If degeneration is progressive and atrophy is proceeding rapidly, ultimate prognosis for recovery is bad. If muscles which have demonstrated degeneration later progressively regain their electrical irritability, prognosis is favorable.

The convalescent stage follows closely on the subacute stage. This stage is one of continuous effort to prevent atrophy, conserve muscle power, and progressively attempt to develop muscles through re-educational muscle training. Heat and massage are indicated in improving nutrition of muscles. Electrical stimulation may serve as an adjuvant to muscle re-education. In this stage, as strength and stability return and needs for support become less, artificial aids as shoes, wedges, braces, and crutches should be altered or gradually discarded except as needed for joint stability and balance. The hazards of life's daily contacts, as well as the patient's stability, should be considered before radical removal of support is advised.

It is at this point that we find ourselves in that late residual stage where orthopedic surgery is a primary indication with recourse to well-established surgical procedures. Stabilizing operations, muscle and fascial transplants, will do much to simplify and lessen the needs for crutches and braces. Physical therapy postoperatively may be indicated to develop efficient body function.

SUMMARY

1. This paper is broad in its concept, avoiding, as far as possible, present controversies regarding the treatment of anterior poliomyelitis.

2. A safe and thorough outline for the complete treatment of anterior poliomyelitis is given.

3. The particular problems presented in each of the four stages of anterior poliomyelitis are discussed, and suggestions given for the treatment in each stage.

4. The physical therapy aspects have been carefully considered in the subacute and convalescent stages of anterior poliomyelitis, when physical therapy must play the most important role.

5. My conclusions herewith set down are based upon more than fifteen years of experience in institutional physical therapy.

6. For three years I have had opportunity to investigate Sister Kenny's treatment in operation in a children's hospital, in a general hospital, and in an orthopedic hospital in New York City.

7. In writing this paper, I have given due consideration to the previously accepted "methods" of treating anterior poliomyelitis, to the contributions of Sister Kenny to the subject, and to recent researches.

8. I present this paper as representing the sum total of my opinions regarding the treatment of anterior poliomyelitis as of this date. If treatment is carried out as outlined, a maximum of function should be salvaged to the anterior poliomyelitis patient.

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DUST BRONCHITIS

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THE harmful effects of dust are widely appreciated. Anthracosis, silicosis, and asbestosis have become diseases of industry.[1] Dust containing pollen particles causing hay fever, asthma and even dermatoses has been extensively studied.[2, 3]

Herein is described an epidemic of bronchitis, obviously related to prolonged exposures to dust, which occurred in an orphanage housing approximately 365 children ranging in ages from 3 to 16 years. This institution, with a personnel of forty adults, is located on the outskirts of Cleveland.

We became interested when we started to see children with intractable coughs without any discharge from the mucous membranes of the nose or throat. In looking about for a cause, one of the personnel called attention to the fact that the children played on a large clay field where the surface dirt had become finely pulverized by their constant activity, and dust bronchitis was considered.

During 1941 and 1942 sixty-three children with coughs were admitted to the infirmary (Table I).

Diseases of the respiratory tract or those of a transmissible and contagious nature were ruled out as causative factors. The patients lived in many different cottages, no one of which had a comparatively greater number of ill children. This was true whether the children admitted were examined chronologically or at any one given time. No adults contracted bronchitis, an unlikely sequelae if the infection were bacterial or viral in origin.

We endeavored to determine the causal relation rainfall would have on the case incidence. In this connection, the number of days during which rain falls and the total rainfall would be indices of the degree to which surface dirt would become dry enough to become pulverized. During a protracted hot period, a little rain might fall which would be of little value, since it would merely wet the surface. The actual picture could only be reflected in the accumulated deviation from the normal. The playground used by the children is on high land—draining immediately within 100 to 200 feet into a valley, so that a drenching rainfall would be needed to wet the ground thoroughly. Good wetting would be obtained if the rainfall were heavy enough, even though the rainless intervals were longer than five days.

Earlier weather conditions might also directly affect the degree to which the surface earth could be pulverized and would indicate the period of exposure before the children developed the bronchitis.

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TABLE I

MONTH	NUMBER OF PATIENTS	RAINLESS DAYS	ACCUMULATED DEVIATION	PERIODS OF 5 OR MORE RAINLESS DAYS
		1941		
April				
May				
June	1	22	-5.27	3
July	24	16	-5.27	0
August	16	20	-5.68	2
September	7	17	-7.06	1
		1942		
April	4	15		5
May	1	11	+1.87	1
June	0	10	+2.45	1
July	8	16	+3.42	1
August	1	17	+4.06	1
September	1	10	+4.79	0

The first cases seen in 1942 occurred during April after fifteen consecutive rainless days. Later that year a few more cases were seen, always after several consecutive rainless days or a period during which there was low rainfall.

The number of cases in 1942 was fifteen and in 1941, forty-eight. The total monthly rainfall in 1942 was in excess of normal in every month except September, whereas there was a progressively increasing rainfall *deficit* in 1941.

CLINICAL PICTURE

The patients were healthy and apparently normal. Often the first sign of dust bronchitis was an explosive, intractable, unproductive cough which so annoyed the listeners that the individual affected was reported to the nursing attendant. Usually the first evidence of an outbreak was observed in chapel where violent fits of coughing would nearly disrupt services.

Subjectively the only complaint was an uncomfortable tickling sensation in the throat accompanied by an uncontrollable cough which was aggravated by excitement or by lying flat on the back. Objectively the patient was comfortable unless activated in some manner. Coughing, once initiated, would be very severe, sometimes to the point of vomiting. The fever was a little above normal, that is, about 101° F., and disappeared after a period of from twenty-four to forty-eight hours' rest in bed.

Inspection, percussion, and palpation of the chest revealed nothing abnormal. There was no dyspnea or cyanosis. On auscultation, loud rhonchi were heard, most commonly over the large bronchi, particularly over the bases, and most frequently over the left more than the right. There were wheezing and whistling noises in the chest, but there were no modifications of inspiratory or expiratory sounds and no fine parenchymatous râles. A deep breath often initiated a coughing spell. The

TABLE II

CHILDREN ADMITTED TO INFIRMARY FROM INDIVIDUAL COTTAGES BY WEEKS

1941	COTTAGE NUMBER									
	6	7	8	9	10	11	12	13	14	?
June									1	
July 6-12	2		2	1					4	
13-19								1		
20-26	1	1			1				1	
27-8/2	1	1	1	2	3			1	1	
Aug. 3-9	2		1	1	4				3	1
10-16		1				1				
17-23		1	1							
24-30										
Sept. 8/31-9/6	1					1		2		
7-13	1					1		1		
Totals	8	4	5	4	8	3	0	5	10	1

1942	COTTAGE NUMBER									
	6	7	8	9	10	11	12	13	14	?
April									2	
May			1						2	
June		1								
July 5-11		1								
12-18		1			1					1
19-25		1								1
26-8/1										1
Aug.										1
Sept.									1	
	0	4	1	0	1	0	0	0	5	4

children soon learned that shallow breathing was more comfortable. They were in a measure incapacitated, since they could not follow their usual routine without experiencing severe coughing spells.

It might be considered that the diseased condition lasted as long as râles could be heard. This period of time varied from three to fifty-two days, the mean duration being 12.7 days, and the mode, between nine and ten days.

ROENTGEN FINDINGS

Thirteen of the sixty-three children were radiographed. The composite picture was described by Dr. David Steel and Dr. J. Robert Andrews as follows:

There was soft-appearing patchy mottling with increased markings along the course of the bronchi, usually the descending ones. Ulceration, calcification, retraction, or emphysema were not present. The shadows looked not unlike those found in bronchiolitis obliterans, except that the mottling was coarser. This might have been due to the fact that in these children the larger bronchi were involved. The lungs showed no other changes.

TREATMENT

The treatment of this condition is prophylactic and symptomatic, the former being the most important. Industry has been conscious of the ill effects of dust, and the industrial hygienists have devised many methods of controlling dust which, in most instances, have been adequate. Where large plots of unplanted earth are permitted to become dry and pulverized, the dust formed might well lead to this type of bronchitis.

It would seem likely that this condition could also arise in the large camps of the Armed Forces, as it has arisen in the Dust Bowl. Blue[4] examined fifty-six subjects from this area. Eighty-six per cent experienced coughing during and for a day or two following dust storms; 35 per cent had a dry hacking cough; 45 per cent had a productive cough. He x-rayed all of his patients and in all he found increased hilar shadows and broad lines toward the root of the lungs, which were interpreted as generalized fibrosis. Among other things he concluded that dust aggravates allergic conditions, that dust pneumonia is a myth, that dust is not a predisposing factor in influenza, pneumonia, or other acute communicable diseases of the lungs, and that dust produces a marked immediate, but transitory, irritation to the mucous membranes of the eyes, nose and accessory sinuses, throat, and bronchial tubes—an irritation which tends to become chronic with long-time exposure.

A prolonged, severe bronchitis which, according to our figures, can affect as many as 13 per cent of the exposed population would surely be a definite handicap to the expedient execution of Army maneuvers. The prevention of dust dispersion is easily accomplished by frequent wetting

of the soil with water, by daily soaking the soil, by mixing it with some binder such as calcium chloride, by asphalting the surface, etc.

The patient is treated symptomatically with sedatives and expectorant cough remedies.

COMMENT

Van Wijk and Patterson[5] claim that 25 per cent of particles of 0.2 μ diameter are removed from the inspired air; that the percentage of removal is nearly proportional to the square root of the size of the particles, up to 2.0 μ, in which case 80 per cent are removed. From 3 to 5 μ the percentage of removal slowly increases to 95 per cent. Drinker and Hatch[1] also state that the larger particles are more easily trapped and excreted.

One might speculate as to where dust particles could be retained in the respiratory tract. Experiments in vivo, whereby dust-laden air was passed through the nose of a subject and out through his mouth, have shown that particles of from 15 to 20 μ in diameter are most liable to be caught in the nasal passages.[1] Findeisen[6] states that particles of 10 μ are caught in the trachea, large bronchi, and mucous membranes and that particles as small as 5 μ are caught in the smaller passages of the respiratory tract. By means of calculations which took into account sedimentation, Brownian movement, kinetic inertia and wall effect, he concluded that 65 per cent of particles from 0.1 to 0.3 μ in diameter are retained in the alveoli. Other workers[1] have demonstrated that 70 per cent of the particles in a silicotic lung examined post mortem are found to be less than 1.0 μ in diameter.

It would appear likely, therefore, that larger particles from 1.0 to 10.0 μ in diameter tend to be deposited in the larger air passages where they constitute a source of irritation and a constant physiologic stimulus for expulsion. The cilia react and there is forcible expulsion of the bronchial contents. Should the exposure to high concentration of dust-laden air be prolonged, the usual physiologic mechanisms will not rid the bronchi of this source of irritation immediately. The end result would be a foreign body reaction in the tissues of the bronchial mucosa with local migration of phagocytes and fibroblasts about the irritated areas. This, in time, would lead to a thickened bronchial mucosa and become a constant stimulant to the nerve receptors, with a resultant persistent cough.

SUMMARY

A type of bronchitis associated with prolonged exposure to high concentrations of dust has been described, a bronchitis having no characteristic of an infectious disease, a bronchitis which was correlated with sparsity of rainfall. This type of bronchitis has been previously described from the Dust Bowl area.

The authors wish to express their thanks to Sister M. Ethelreda of Parmadale, Children's Village of St. Vincent de Paul, who kept records of the cases.

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PNEUMONIA, PNEUMOTHORAX, AND EMPHYSEMA FOLLOWING INGESTION OF KEROSENE

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PULMONARY manifestations following the accidental ingestion of kerosene are rather common in young children.

Waring,[1] in 1933, Nunn and Martin,[2] in 1934, and Lesser, Weens, and McKey,[3] in 1943, have concluded from clinical or experimental studies that the pulmonary manifestations are due to aspiration rather than to absorption from the gastrointestinal tract.

Lesser, Weens, and McKey[3] reported thirty-three children with kerosene poisoning, two of whom developed fluid in addition to pulmonary consolidation. In one patient the fluid disappeared spontaneously and in the other surgical drainage was required for the empyema.

It is the purpose of this communication to report an unusual complication following the accidental ingestion of kerosene, namely, pneumonia, pneumothorax, and emphysema of the soft tissues of the chest.

A 2-year-old white male child was admitted to the Children's Free Hospital Dec. 22, 1941, with a history of having ingested from one to two ounces of kerosene about two hours prior to admission. Before bringing him to the hospital his parents gave him some cream which caused him to vomit.

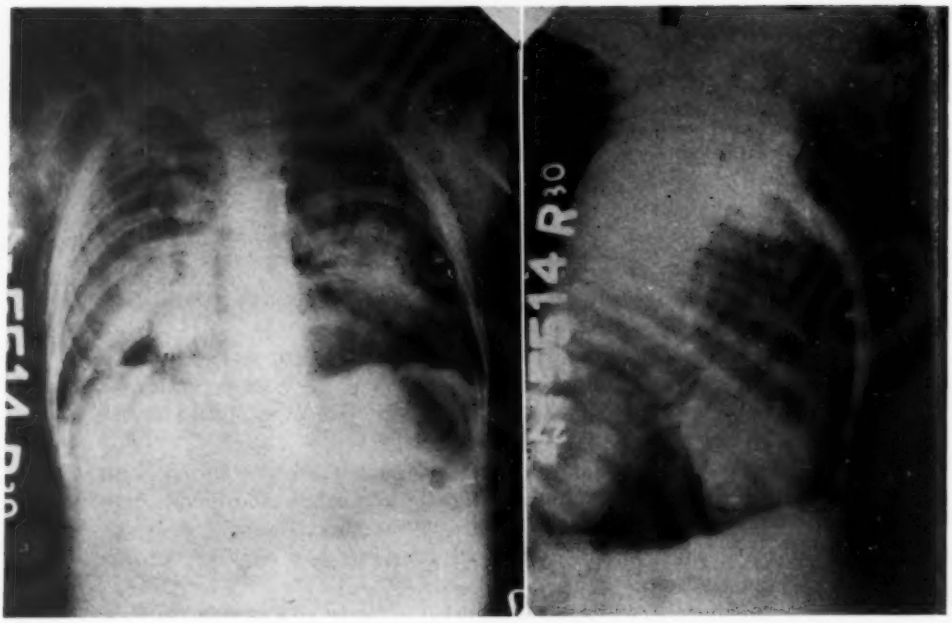
Physical examination on admission revealed a well-developed and well-nourished comatose white male child who appeared acutely ill. There was a strong odor of kerosene about the face. There were numerous moist râles heard throughout the lung fields, but there was no demonstrable change to the percussion note. Aside from considerable distention of the abdomen, the remainder of the physical examination was not remarkable. The rectal temperature was 99.6° F., with respirations of 48 per minute.

Because of his apparent pulmonary edema, he was given an immediate continuous infusion of 500 c.c. of 20 per cent glucose followed by 10 per cent glucose in distilled water. In addition he was given oxygen continuously, and caffeine sodiobenzoate was administered as a stimulant. A saline enema followed by a rectal tube was used to relieve the abdominal distention. No gastric lavage was performed.

The blood count on admission revealed a red blood cell count of 4,950,000 per cubic millimeter with hemoglobin of 13 Gm. per 100 c.c. and a white blood cell count of 22,500 per cubic millimeter with 74 per cent polymorphonuclear leucocytes and 26 per cent lymphocytes. Except for a mild glycosuria which was thought to be due to the intravenous glucose, the urinalysis was negative.

Within two hours the child was conscious. The next morning, even though his temperature had risen to 103.2° F., he was very alert and a bland diet was taken well.

From the Department of Pediatrics, University of Louisville School of Medicine, service of Dr. James W. Bruce.



A. Fig. 1. *B.*

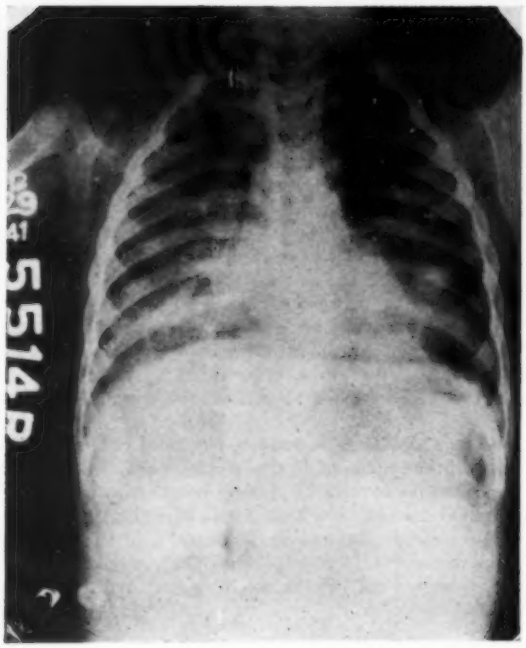


Fig. 2.

In view of the rise in temperature with an elevated white blood cell count, it was thought advisable to administer sulfathiazole, which was given in a 1 Gm. "stat" dose followed by 0.5 Gm. every four hours. On December 25, three days following admission, his temperature became normal and remained so until discharge.

An examination Dec. 25, 1941, revealed emphysema of the soft tissues of the neck and chest and numerous fine crepitant râles throughout the lung fields. A teleroentgenogram of the chest on the following morning revealed a left pneumothorax with partial collapse of the left lower lobe. The entire left lung showed a dense, patchy, hazy process which was markedly increased in the lower lobe. On the right there was an irregular haze except in the cardiophrenic sinus where consolidation was present. Overlying this region was an area of decreased density which measured 3 cm. and was apparently a fluid level. The heart was slightly displaced to the right and slightly enlarged. An extensive soft tissue emphysema over the upper abdomen and thorax extended to the neck and face. The roentgenogram diagnosis was aspiration pneumonia, bilateral pneumothorax with possible bronchopleural fistula on the right, and soft tissue emphysema (Fig. 1*A* and *B*).

Treatment was symptomatic except for the sulfathiazole medication.

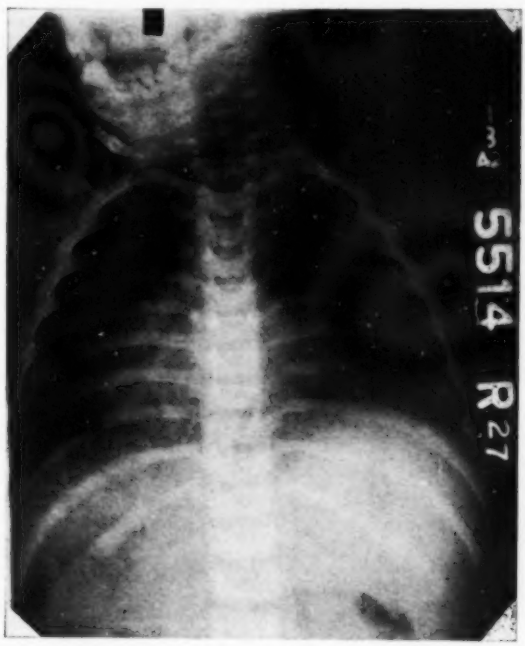


Fig. 3.

On December 29 another roentgenogram revealed the left pneumothorax to be clearing, with partial re-expansion of the lower lobe. The parenchymal reaction in both lungs had become more homogeneous. The former fluid level on the right had disappeared. The heart was almost in the midline, and the soft tissue emphysema was less marked (Fig. 2).

Following this his emphysema gradually disappeared and the patient made an excellent convalescence. In spite of his normal temperature, sulfathiazole medica-

tion was continued until Jan. 3, 1942, at which time the physical and roentgenologi: examinations were interpreted as normal (Fig. 3). He was discharged Jan. 4, 1942.

SUMMARY

Pulmonary manifestations following the accidental ingestion of kerosene are rather common in young children, but this is believed to be the first case reported complicated by pneumonia, pneumothorax, and emphysema.

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TREATMENT OF MENINGOCOCCIC MENINGITIS AND SEPTICEMIA

Sulfadiazine, Sulfanilamide, and Serum Therapy

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MENINGOCOCCIC meningitis, as is a well-known fact, has played a very important role as an etiologic factor in the morbidity and mortality rates among men of the Armed Services during previous wars. In this conflict it again has made its appearance, as was to be expected. However, due to improvement in management of the patient and introduction of new means of therapy, the morbidity and mortality rates have been reduced dramatically.

In this study of 148 consecutive cases at a station hospital the first forty-eight patients were treated with sulfanilamide and antimeningococcic serum. The remaining patients were treated with sulfadiazine primarily; antimeningococcic serum was used in only fourteen patients. As an adjunct treatment, blood plasma was used in those patients manifesting shock or severe toxicity.

These two groups of cases are not presented primarily as a comparative study, realizing that there are more than twice as many cases in the study treated with sulfadiazine as with sulfanilamide. However, we believe they are worthy of comparison because both series extended through the peak of the disease in consecutive years at the same army post. Wherever feasible, comparative values will be given.

SYMPTOMATOLOGY

Although meningococcic meningitis has been described since 1887, when Weichselbaum discovered the causative organism, it has been only in the past twenty-five years that successful progress has been made in diagnosis and treatment.

Unusual conditions, such as large numbers of troops in camps or the crowding of soldiers in barracks, have led to outbreaks in military reservations. This fact assumes great importance because the disease is largely a cold weather infection. This fact was borne out in our study in that we noted a sharp rise in the number of cases during cold, rainy spells of weather. This was especially true in the month of February (1943), a cold, rainy month, in which we reached our peak of proved cases, totaling forty-one in all. This peak was followed by a sharp drop in incidence with advent of warm weather. For example, there were sixteen proved cases in the month of May of that year.

Mode of transmission is by direct contact with nasal and oral secretions of the patient, by carriers, and by the common housefly. The

carrier rate rises as high as from 40 to 70 per cent during epidemics. It was found during a previous cross-sectional study of this post that approximately 30 per cent of the personnel were carriers. However, no attempt was made to determine virulence or type of meningococcus found.

Immunity is lasting following one attack. We observed no recurrences in our study over a period of one year. The disease is highly infectious and of moderate virulence; however, it has been our observation during the past winter that as the winter months progressed the virulence of the organism increased. This was manifested by the fact that individual cases became more severe during the latter months of the winter season.

It is generally conceded that there are three phases of meningococcic invasion of the human body; (1) nasopharyngeal, (2) invasive or septicemic, and (3) meningeal. As regards the first phase, undoubtedly many of those cases were diagnosed as nasopharyngitis and discharged as such because no routine throat cultures were done on the respiratory service. However, because the entire medical staff was meningitis conscious and a rigid constant lookout was kept for signs of meningeal irritation, the patients were transferred to the contagion service immediately when any sign or symptom of the invasive stage or meningeal irritation were found.

One point worthy of mention in the discussion of the symptomatology of meningococcic meningitis, as revealed by this study, is that all patients were seen much earlier in the course of the disease than would have been possible under any other circumstances. Patients are seen earlier in the Armed Services because they are seen earlier by the physician and immediately hospitalized and under observation. This undoubtedly is a factor in creating a difference of the clinical picture wherever it exists in our study as compared to the picture presented to the physician in civilian practice.

All symptoms and physical signs, including laboratory findings, were noted on admission and within twenty-four hours following admission. The constancy of certain signs and symptoms in the patients of both series is enlightening.

The early clinical picture is that of septicemia, rather than of meningitis, the meningeal symptoms and signs developing within from two to four days after onset in the majority of instances. However, about 25 per cent gave a history of explosive onset. Other indications of a generalized blood infection, such as involvement of joints, were sometimes present even before meningeal symptoms.

The fulminating type is rare except in epidemics. Two cases were present in the first series and seven in the second. This type is characterized by a violent onset. The patient is usually seized with severe headache, shows an overwhelming toxemia, rapidly losing consciousness and, if death results, it occurs from one to thirty-six hours after onset of symptoms.

The age incidence of Series I ranged from 18 to 38 years, with 63 per cent of the patients falling into the 18- to 25-year group. Patients were all white, due to the population of the camp being all white at the time. In Series II the age incidence ranged from 17 to 39 years, with 75 per cent of the patients in the 18- to 22-year group. Racial incidence is undetermined because the population of the camps was predominantly white during the period in which this series was run. It is also noteworthy that the fatalities occurred in those in the older age group.

In examining Table I many interesting observations are brought to light.

TABLE I

TABULAR PRESENTATION OF SIGNS AND SYMPTOMS OF MENINGOCOCCIC MENINGITIS

	SERIES I (48 CASES)		SERIES II (100 CASES)	
	CASES	PERCENTAGE	CASES	PERCENTAGE
Headache				
On admission	42	88	92	92
Twenty-four hours after admission	2	4	3	3
None	4	8	5	5
Stiff Neck				
On admission	36	75	81	81
Twenty-four hours after admission	6	12.5	6	6
None	6	12.5	13	13
Sore Throat—On admission	26	54	82	82
Petechia				
On admission	39	81.25	64	64
Twenty-four hours after admission	3	6.25	5	5
None	6	12.5	30	30
Nausea and vomiting	30	63	30	30
Convulsions	2	4	2	2
Neurologic Findings				
Brudzinski's neck sign	24	50	71	71
Kernig's sign	21	44	78	78
Babinski's sign	2	4	7	7
Deep tendon reflexes				
Hypoactive	6	12.5	11	11
Normal	19	39.5	37	37
Hyperactive	21	44	48	48
Severity				
Moderate	24	50	38	38
Severe	22	46	55	55
Fulminating	2	4	7	7

The headache was described by the majority of the patients as of sudden onset and severe intensity, generalized, and radiating into the occipital region. Several termed them as "blinding" and complained of diplopia, of which there were ten cases—all involved the superior oblique nerve, seven being bilateral, all transient, and all clearing in about five days. In about 30 per cent of the cases the onset of the headaches was followed shortly by vomiting.

The stiff neck varied from a mild stiffness, or soreness, to marked rigidity of the cervical region. In no case was there a clinical opistho-

tonus. We believe this to be true because all patients were seen in very early stages of the disease. Soreness of the throat was described primarily as a moderate dryness to a moderately severe sore throat, with dysphagia a minimal feature.

The incidence of petechiae was high and characteristic, the range being from a small, almost minute, pink macule to a large maculopapular, purpuric eruption. Seventy-five per cent or 112 cases, of the total of both series (148 cases) revealed petechiae on admission or within twenty-four hours. Petechiae were observed early in the legs, abdomen, and chest, rapidly becoming generalized and persistent for from four to six days. In seven pataients marked petechial hemorrhage was noted in both bulbar and palpebral conjunctivae and on the soft palate, the occurrence coinciding with that found on the body. One striking case was that of a patient clinically free of manifestations on the fifth day who developed generalized petechiae without any exacerbation of symptoms.

Convulsions were seen in a remarkably small number of cases, occurring only in four patients of the entire series, being evenly divided between the two studies. Contrary to the generally expressed opinion that the presence of convulsions indicates a poor prognosis, only one of our four patients manifesting convulsions expired.

The high incidence of Brudzinski and Kernig's signs is noteworthy. By comparison, the number of cases exhibiting the presence of Babinski's signs were very few in number as compared to those cases exhibiting Brudzinski's neck sign and Kernig's sign. As classically described, the deep tendon reflexes are usually portrayed as being hyperactive. In both series of cases the incidence of normal reflexes, as noted in Table I, was approximately 38 per cent. However, about one-half of the patients did present the classical hyperactive deep tendon reflexes. The findings presented graphically were those observed on admission, early in the course of the disease. All hypoactive reflexes were seen to become hyperactive within from two to three days after admission. The majority of the normal reflexes became hyperactive late in the acute illness. We believe that this evolution of reflex action is an indication that the primary toxic effect is one of depression of the deep tendon reflexes and that there is a transition through the normal state to hyperactive reflexes, indicating later development of meningeal irritation.

As regards the severity of the disease in the camp during the periods of the two series, several interesting facts come to light. In the first place, the number of fulminating cases treated was surprisingly low in comparison to other reported series. For example, in the series of 1,211 cases reported by Top[1] in 1927-1936, 280, or 23.1 per cent, were classified as fulminating. This percentage is relatively high as compared to nine cases in a total of 148, or 6 per cent, as was the incidence in our series. The total number of severe cases was proportionately high for the series. However, it is noteworthy that the greater number

of these severe cases occurred during the winter months. The converse is also true that the greater number of moderate cases occurred during the spring and summer months, in which the weather was warmer and drier. As noted by other observers, we have found that the incidence drops to scattered cases during the summer months, namely, the months of June and July.

TREATMENT

The rapid changes observed in the method of treatment of meningococcic meningitis and meningococcemia during the past ten years may be attributed to several factors. In the first place, prior to the introduction of sulfonamide therapy, the only specific therapeutic agents available were antimeningococcic serum and meningococcic antitoxin. The administration of these agents, either singly or in combination, produced far from satisfactory results in the reduction of mortality rate, whether used intravenously, intrathecally, or by both routes. For example, in the Boston epidemic of 1904-1907, in 181 cases, with no specific therapy, a mortality rate of 67.3 per cent was reported. As late as 1936 Hoyne,[2] using antimeningococcic serum and meningococcic antitoxin, reported a group of 4,028 cases with a mortality rate of 47.7 per cent.

Since the introduction of sulfonamide therapy in 1936, when Long reported ten cases treated with sulfanilamide, most of the sulfonamide derivatives have been tried, either singly or in combination with antimeningococcic serum. Up to the past year, sulfanilamide and sulfapyridine have been the preparations most extensively used. Sulfathiazole has not been favored in the United States because, as expressed by Carey (1940),[3] "it should not be used in the treatment of meningitis as its concentration is only 10 to 30 per cent that of others in body fluids." Sulfapyridine has been most favored by English workers with a noteworthy reduction in mortality rate, but still leaving much to be desired. Jordan, Blakelock, and Johnston[4] reported 160 cases in 1940, dividing them into four groups. Fifty patients were treated with antimeningococcic serum, fifty with sulfapyridine, thirty with sulfapyridine and serum, and thirty with sulfapyridine and meningococcic antitoxin. Mortality rates were reported for each group as 38 per cent, 32 per cent, 26.6 per cent, and 20 per cent, respectively. Comparable mortality rates are reported with the use of sulfanilamide alone and in conjunction with antitoxin and serum.

Despite the fact that numerous reports appear in the literature on the use of sulfadiazine in the treatment of pneumococcic pneumonia, we are able to find only three groups of cases of meningococcic meningitis reported. In 1940 Dingle, Thomas, and Morton[5] reported a group of thirteen cases of meningococcic meningitis and one case of meningococcic septicemia in which the patients were treated with sulfadiazine, all recovering except one. Trevett, Nelson, and Long[6] list three patients

treated with sulfadiazine, with one fatality. In 1942 Feldman, Sweet, and Dowling[7] reported a series of twenty-four patients given sulfadiazine orally and sodium sulfadiazine intravenously as indicated with only two deaths. It is very true that individually and collectively these are small groups of cases from which to judge the efficacy of a drug. However, it is worthy of note that in this total of forty patients, comprising the three series treated with sulfadiazine, there were only four deaths and no report of severe side reactions to the drug.

As stated previously, the group of cases here reported is divided into two groups in regard to treatment. The first group is composed of forty-eight patients treated during the winter of 1941-1942 under the direction of Captain John L. Mothershead.

As shown in Table II, sulfanilamide was used in conjunction with antimeningococcic serum. A lumbar puncture was performed immediately on a patient suspected of meningitis. Diagnostic information gained by study of the spinal fluid was provided by the laboratory within one-half hour, with the exception of the culture of the fluid. Sulfanilamide was given orally when possible, otherwise a 1 per cent solution

TABLE II

SULFONAMIDE AND ANTIMENINGOCOCCIC SERUM THERAPY

Sulfonamide Therapy				
	NUMBER OF CASES	INITIAL DOSE	TOTAL DOSE	
			RANGE	AVERAGE
Sulfanilamide				
Oral administration	34	3.3 Gm.	8-87 Gm.	44.4 Gm.
Subcutaneous administration	14	4.0 Gm.		
Sulfadiazine				
Oral administration	52	4.0 Gm.	14-194 Gm.	78.0 Gm.
Intravenous administration	48	5.0 Gm.		
Blood levels				
	Range	*Average*		
Sulfanilamide	5.5-20.4 mg. %	10.1 mg. %		
Sulfadiazine	5.3-46.1 mg. %	18.1 mg. %		
Reactions				
Sulfanilamide				
Cyanosis and malaise	8			
Sulfadiazine				
Renal pain	10			
Hematuria	7			

Antimeningococcic Serum Therapy		
	GROUP I	GROUP II
Number of patients treated	40* (83.3%)	14 (14%)
Dosage administered	30-60 c.c.	30-90 c.c.
Reactions		
Urticaria occurring from seventh to eleventh day	24 (60%)	5 (35.7%)
Allergic arthritis	3 (7.5%)	2 (15%)
Immediate reaction	3 (7.5%)	3 (21.4%)
Fatalities	0	0

*Four patients in Group I received serum intrathecally; all other patients, intravenous injections.

of the drug in normal saline was administered subcutaneously. The dosage schedule consisted of an initial dose of 3.3 Gm. orally, followed by 1.33 Gm. every four hours. In the fourteen patients unable to take the drug orally, 4 Gm. were given subcutaneously as an initial dose. Oral administration was attempted in six hours; if not retained, the subcutaneous dose was repeated. The average dose, as may be seen in Table II, was 44.2 Gm., with an average peak blood concentration of 10.1 mg. per cent. Among the forty-eight patients thus treated, eight developed cyanosis and malaise, which quickly cleared when the drug was discontinued. Treatment, otherwise, was terminated when the patient was temperature-free for three days and asymptomatic which, in the majority of cases, was between the eighth and eleventh days.

Concurrently with the initial dose of sulfanilamide, and after skin sensitization testing, antimeningococcic serum was given intravenously, using from 30 to 60 c.c. diluted in 500 c.c. of normal saline. Four patients received from 10 to 15 c.c. serum intrathecally. Serum was repeated as indicated in the individual case. Of the thirty-four patients receiving serum, five developed immediate reactions manifested by symptoms of shock and apnea, none resulting in fatalities. Twenty-four patients developed urticaria between the seventh and eleventh days, with three in the latter group manifesting transient allergic arthritis. All cases cleared in from three to five days with no treatment.

Lumbar puncture was repeated after the initial procedure only in those patients manifesting continued high or increasing cerebrospinal fluid pressure or in those cases in whom the diagnosis was in doubt.

The later series of 100 cases was started in September, 1943. Sulfadiazine and sodium sulfadiazine were substituted for sulfanilamide and some alterations were made in the general routine. Therapy was instituted immediately after a positive spinal fluid report was received or in those patients in whom, regardless of a normal spinal fluid, typical petechiae and signs of sepsis or toxemia were present. The dosage schedule consisted of an initial dose of 4 Gm. of sulfadiazine orally, followed in four hours by a second dose of 4 Gm., then 2 Gm. every four hours for the duration of treatment. If the patient was vomiting, uncooperative, or comatose, an initial dose of 5 Gm. of sodium sulfadiazine dissolved in 500 c.c. of distilled water was given. Six hours after the initial dose of sodium sulfadiazine, an attempt was made to give the patient 2 Gm. of sulfadiazine by mouth. If unsuccessful, the intravenous injection of 5 Gm. of sodium sulfadiazine was repeated. In the majority of the forty-eight patients requiring intravenous therapy, only one dose was necessary and only three patients required more than two intravenous injections before they were able to take oral medication.

When sulfadiazine was first used on our service it was impossible to say how many days the drug should be continued. Realizing the possibilities of relapse of the disease, it was decided to continue treatment for a minimum of eight days unless contraindicated by side reactions

to the drug such as renal symptoms, anuria, hematuria, anemia, or leucopenia. It may be said that since this series has been closed the length of treatment has been reduced to six days. Sixty-four cases have been treated with no occurrence of relapse.

Immediately on instituting sulfadiazine therapy a complete blood count and urinalysis were done and repeated every second day. Twenty-four-hour fluid intake and output were recorded. If the fluid intake was less than 3,000 c.c. for the twenty-four-hour period, the deficiency was made up by intravenous injection of 5 per cent glucose in normal saline. Sulfadiazine therapy was discontinued immediately if any of the above-mentioned untoward symptoms developed or if the ratio of output to intake of fluids fell to a subnormal level. As shown in Table II, in only 10 per cent of the 100 cases did such symptoms occur. The renal pain in all patients was mild. In eight of the ten cases the patients were asymptomatic in twenty-four hours after the sulfadiazine was discontinued. When these symptoms were evident, the patient was immediately given 1,000 c.c. 5 per cent glucose in normal saline intravenously, fluids urged by mouth, and sodium bicarbonate, 20 gr., given orally every four hours. In the remaining two patients ureteral catheterization was necessary to dislodge the crystals from the ureter. All patients made complete uneventful recoveries with no sequelae observed. All patients were strictly confined to bed during the entire course of treatment.

Of the 100 patients thus treated, forty-eight received the initial dose in the form of sodium sulfadiazine, 5 Gm. intravenously; in the other fifty-two, oral administration was possible. The range and average doses are shown in Table II. It is interesting to note that patients tolerated well approximately twice as much sulfadiazine as sulfanilamide and reached approximately twice the peak blood level of the drug with no greater proportion of untoward symptoms. As demonstrated in Table III, those patients in the sulfadiazine group, with higher blood levels, had fifty per cent less days of acute fever and days of acute illness, also shorter duration of coma and irrational state. It may be said at this point that because there is no proved optimum blood level of sulfadiazine at which maximum therapeusis is obtained, no attempt was made

TABLE III

COMPARISON OF CLINICAL COURSE

	SULFANILAMIDE (DURATION IN DAYS)		SULFADIAZINE (DURATION IN DAYS)	
	RANGE	AVERAGE	RANGE	AVERAGE
Fever	1 to 29	9.9	1 to 15	4.3
Stiff neck	1 to 8	4.8	1 to 11	5.0
Coma	1 to 4	2.0	1 to 3	1.2*
Irrational state	1 to 7	3.1	1 to 4	1.3†
Days of acute illness	1 to 23	10.0	1 to 9	4.1
Hospital days	----	38.8	----	30.2

*Eight cases in sulfanilamide series; twenty-one cases in sulfadiazine series.

†Twenty-three cases in sulfanilamide series; forty-one cases in slufadiazine series.

to set an arbitrary maximum blood level. The maximum blood level was reached for the individual patient at which there were no untoward symptoms in an effort to gain the maximum bacteriostasis in vivo.

Blood plasma was given intravenously in the amount of 500 c.c. to all patients manifesting symptoms of shock or severe toxicity. This was repeated as indicated, the maximum amount used for an individual patient being 1,500 c.c. in a twenty-four-hour period. Results obtained in reducing toxicity and raising blood pressure from hypotensive levels were very dramatic. Marked improvement was noted as early as three hours after administration. Not a single reaction was encountered in the seventy-five doses given. The plasma was used undiluted and was routinely filtered and allowed to flow at the rate of from 30 to 40 drops per minute.

Antimeningococcic serum was administered to only fourteen of the 100 patients. These cases were either fulminating or extremely toxic. It was used primarily as heroic measure and it may be said no dramatic results were noted. All serum was given intravenously following negative skin and conjunctival sensitivity tests. The initial dose was 30 c.c. in 300 c.c. of normal saline and was repeated as indicated in the individual case, the maximum dose being 90 c.c. No attempt was made to determine the type of the infecting organism. Of the fourteen patients treated, three displayed evidence of immediate shock with blood pressure readings as low as 50 systolic and 40 diastolic mm. Hg. Immediate administration of adrenalin, intravenous blood plasma, and hypertonic glucose solution alleviated serious symptoms. Five patients developed urticaria on the seventh to eleventh days and two developed transient allergic arthritis of ankles and wrists. All joint manifestations cleared within three days without treatment.

The same regime was used for the two series. The results were tabulated and are shown in Table III. The designation of fever is any temperature above 99° F. taken orally. The patient had to remain afebrile during the remaining course of the illness. Any twenty-four period of normal temperature during the febrile state was disregarded. The range indicates the shortest and longest febrile course within the series. Any resistance or pain in flexion of the neck was considered indicative of stiffness, each patient being checked once or twice daily until all evidence had disappeared. Coma was judged as unconsciousness or stupor from which the examiner was unable to rouse the patient. Irrational state indicated a consciousness but lack of cooperation to extreme wildness, during which strong sedation and constant attendance were necessary. In Table III, "days of acute illness" was designated as that period of time during which the patient had any complaints and terminated when the patient was entirely asymptomatic. The minimum hospital days, regardless of how light the case, was twenty-seven, and maximum days were determined by the time required for disposition, to duty, transfer to a General Hospital, or disability discharge from the Army.

On examining Table III several interesting facts become evident. The patients in both series were treated at the same military post in successive years through the same seasonal intervals, namely, the winter months, with the peak month of February included in both series. Likewise, those in both series routinely received large doses of a sulfonamide drug. The only wide variations in treatment were (1) extensive use of polyvalent anti-meningococcic serum in the sulfanilamide series (83.3 per cent) with only 14 per cent of the patients in the sulfadiazine group receiving serum, (2) use of intravenous sulfonamide therapy and blood plasma in the sulfadiazine and omitted from the sulfanilamide group. If Table III is examined with these facts in mind it will be noted that the average days of duration of fever and days of acute illness in the sulfadiazine group is less than one-half of those in the sulfanilamide group. Likewise, average days of duration of coma and irrational state were almost one-half those in the sulfadiazine series as compared to the sulfanilamide series, and average hospital days about, one week less. All of this is apparent regardless of the much more extensive use of serum in the sulfanilamide group. The duration of stiff neck was, for all practical purposes, the same in both series, variation in treatment apparently having no effect. Finally it was noted that intrathecal injection of serum had no apparent effect on the course of the disease in the four patients in whom it was used.

LABORATORY FINDINGS

Laboratory findings are obviously of extreme importance in meningococcic infections, as it is from this source that the differential diagnosis is made from other forms of purulent meningitis, or, in the case of septicemia, the type of organism is determined. Also the decision as to whether or not a person is a carrier can only be made by the presence or absence of meningococci in the nose and throat cultures.

In Table IV is found a summary of spinal fluid and blood findings. A detailed discussion of spinal fluid findings will be omitted from this paper as they will be presented at a later date in a subsequent article. It should be pointed out, however, that in approximately 25 per cent of the patients in both series the fluid obtained on the initial lumbar puncture was clear. A large proportion of these cases were of the septicemic rather than the meningitic type. Those of the latter type were very early cases and usually had not as yet developed the classical picture. Another interesting observation is that in the two groups, 33 per cent and 24 per cent of the patients, respectively, revealed normal spinal fluid pressure. There was no correlation between the character of the fluid and the pressure under which it existed. Many very cloudy fluids were found to be under normal pressure. The average spinal fluid cell count was 3,904 and 4,607 cells, in all cases a predominance of polymorphonuclear cells ranging between 74 and 100 per cent. The low number of positive cultures bears out the general opinion that the

TABLE IV

LABORATORY FINDINGS

	SERIES I		SERIES II	
	NUMBER OF CASES	PERCENTAGE	NUMBER OF CASES	PERCENTAGE
Spinal fluid				
Initial lumbar puncture				
Cloudy fluid	32	66	69	69
Clear fluid	11	23	26	26
Initial fluid clear, subsequent fluid cloudy	4	8	5	5
Increased spinal fluid pressure	31	65	76	76
Normal spinal fluid pressure	16	33	24	24
Spinal fluid smear				
Initial spinal fluid, positive	27	64	75	75
Initial negative, subsequent smear positive	—	—*	7	7
Spinal fluid cell count				
Range	0-22,900		0-35,100	
Average	3,904		4,607	
Spinal fluid cultures				
Initial fluid positive	26	62	53	56.4
Initial negative, subsequent positive	—	—	4	4.2
Negative cultures	—	—	37	39.3
Contaminated or not done	—	—	6	6.0
Blood cultures				
Positive	11	52.3†	32	36.3†
Negative	10	47.7†	56	63.6†
Not done or not reported	27	56.2†	12	12.0†
White blood cell count				
Range	2,380 to 42,200		4,600-47,700	
Average	19,724		15,900	
Predominance of polymorphonuclear cells	58-95%‡		65%-94%‡	

*No determinations were done.

†Percentage of positive and negative blood cultures were figured on the basis of the number of cultures done. The percentage of cultures not done were figured on the basis of total number of cases in each series.

‡All cases showed a predominance of polymorphonuclear cells.

organism is difficult to grow. It may be said, however, that since this series has been studied a change in the media has been made with a much higher percentage of culture growths obtainable. An enriched brain broth media has been substituted for enriched beef broth. In the more than forty cases in which the brain broth media has been used the results are highly satisfactory and at present is our media of choice. In the majority of patients having a high spinal fluid cell count, the spinal fluid sugar was too low for comparison; globulin and a pellicle were present.

Concurring with other observers, we found the majority of patients to have a leucocytosis with an absolute polymorphonuclear leucocytosis. Those displaying leucopenia were few in number and in early stages of the disease. Subsequent blood counts showed a leucocytosis, including the fulminating cases. No marked anemia was encountered throughout both series.

There are a number of things which this study has brought out which seem to us to be worthy of comment.

First of all, it is our impression, as it is of other writers on the subject, that the meningococcal infection has as its portal of entry the lymphatics and invades the blood stream before it shows its predilection for the meninges. Often the first symptom noted was arthritis. Some of these patients had a history of malaise of several days' duration, but the onset would at first be dated from a sudden development, such as falling out during drill, sudden dizziness, and in quite a few instances the first symptoms noted were apparent personality changes. These patients would become irritable, hard to get along with, without complaining of being ill or having pain, but within a few hours might become comatose or irrational and quite wild and unmanageable. The one most constant symptom was headache.

We were struck, also, by the large number of patients who showed petechiae, and we feel that the character and distribution of these lesions is quite diagnostic. On several occasions there was observed a rose rash very similar to the rash of Rocky Mountain spotted fever or typhoid fever, and these lesions progressed within a few hours to the formation of petechiae. In one instance the petechiae appeared on the fifth day, though the patient was so improved as to be considered clinically well. We have seen other patients who, on examination, were free of any skin lesion and who would show a shower of petechiae within half an hour. The clinical picture of meningococcemia and meningococcic meningitis has been so varied and, at times, bizarre that it has become our practice not to look for the classical picture of meningitis but to suspect any patient who has unexplained symptoms, even vaguely related to the central nervous system, and who show a severe unexplained toxemia and to inspect very carefully the skin of any patient who comes under our observation. An initial clear spinal fluid should not delay treatment as not infrequently the spinal fluid is clear, under no increase in pressure, and shows no organisms and no increase in cell count at the first spinal puncture (6 per cent). We feel sure that many of these patients would have had cloudy fluid and increased cell count and that organisms would have been demonstrated had repeated spinal punctures been done, but there seems to be no advantage in this procedure and, except in rare instances, only an initial diagnostic puncture was done. This was borne out in nine instances where a second tap was indicated. (A comparative study of normal spinal fluid sugar and the sugar content of the spinal fluid of this series will be reported soon in a paper by one of us.)

Many of the patients were so wild and irrational that sedation became an important factor in the management. Numerous sedatives were tried, including intravenous barbiturates, intramuscular paraldehyde, and, at present, we seem to get by far the best results from a combined dose of codeine and ergotrate. The dose used is 1 gr. of codeine and 1 c.c. ergotrate. It is well to remember that a frequent cause of restlessness is a full bladder and often a catheter is the sedative of choice. We

do not like morphine because of its depressing action on the respiratory system. The response to the treatment was such that in practically all instances the patients needed no sedation within twenty-four hours and were usually quite cooperative by that time.

Complications were not excessive in either series of cases, there being ten patients with arthritis, two with unilateral eighth nerve paralysis, one with bilateral eighth nerve paralysis, one with unilateral seventh nerve paralysis, and one with popliteal embolism in the first series. Herpes simplex was frequently observed in this series. In the second group there were fifteen with arthritis, one in whom all the joints were involved, and this was proved at autopsy. There were three cases where pus was aspirated, in two of which the organism was demonstrated. Other patients showed a serous type of fluid with no organisms, a form of bursitis with predilection for patella or prepatella, and olecranon bursae. Diplopia developed in ten patients and cleared in all within six days. No case of eighth nerve deafness was seen.

In the first series, there were apparently no untoward symptoms from sulfanilamide other than cyanosis, which cleared when the drug was discontinued. In our treatment of the second series we were careful that the patient received not less than 3,000 c.c. of fluid per day, thereby insuring a satisfactory urinary output. In this series ten patients showed symptoms attributable to the sulfadiazine. These symptoms developed on the second to eighth day in all instances and occurred both with small and large amounts of drug given. One patient dedeveloped acute hemorrhagic nephritis on the fourth day which cleared on the eighth day. The patient was asymptomatic throughout this period; however, the urine showed 4 plus albumin and was loaded with red and white blood cells and numerous granular and red cell casts. Two patients developed renal crystals to such an extent that ureteral catheterization was necessary with washing out of the kidney pelves. The others exhibited renal pain or hematuria or both. All of the patients, with the exception of the two in whom ureteral catheterization was necessary, responded promptly when the drug was discontinued and parenteral fluids administered. These observations lead us to feel that crystal formations are due to some chemical reaction or to an idiosyncracy or susceptibility rather than to a high concentration of the drug.

Blood plasma was given in many instances, especially when there was shock or severe toxicity. It is our opinion that plasma was very beneficial in both types of cases.

Serum in the form of antimeningococcic antitoxin was given at first in the severe cases because we did not want to withhold any therapeutic agent that might be of benefit to the patient. As results of the sulfadiazine became more evident, we became less inclined to use this antitoxin and now feel that it would not be indicated unless some patient should have such a sensitivity to the sulfadiazine that the drug could

not be used. Plasma is our agent of choice for shock and severe toxicity because of its greater volume, freedom from reactions, and general effect on the patient. Sulfadiazine has several advantages over sulfanilamide. Of equal importance, if not greater, is the fact that the sodium sulfadiazine can be given intravenously, giving a quick high concentration and relieving any problem of administration or absorption in the comatose, noncooperative, or extremely toxic patient.

No attempt was made to culture the organism from the patients before discharge from the hospital, because of the fact that the work previously referred to showed a 30 per cent carrier rate in the post personnel. We have been able to trace only two cases from known contacts.

The deaths which occurred were all in the fulminating group. In only one of the fatal cases did the patient live more than forty-eight hours after admission to the hospital. There were three deaths in the first series of cases and four deaths in the second series studied. Thirty additional patients have been treated since the completion of the second series. In this last group one death has occurred.

CONCLUSIONS

1. The most constant symptoms in meningococcic infections are severe headache, stiff neck, sore throat, and petechial rash.

2. Low mortality and morbidity are dependent on early diagnosis and adequate treatment.

3. The drug of choice is sulfadiazine or its sodium salt.

4. Sodium sulfadiazine may be given intravenously in large doses without untoward reaction.

5. Satisfactory treatment depends on the use of large doses of sulfadiazine in a relatively short period of time.

6. Blood plasma is an important adjunct in the treatment of shock and severe toxicity.

7. Antimeningococcic serum and meningococcic antitoxin are of doubtful value where sulfadiazine and blood plasma are available.

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THE TREATMENT OF PERTUSSIS WITH LYOPHILE HYPERIMMUNE HUMAN PERTUSSIS SERUM

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PERTUSSIS is one of the most severe acute infectious diseases to which infants and young children are subject. Among young children the number of deaths from whooping cough in the United States is greater than that due to measles and scarlet fever combined. The mortality rate for young infants is about 25 per cent.[1] Sauer[2] has reported that active immunization for pertussis is not practical before the seventh month of life and, since the mortality rate is greatest in this age group, treatment remains a major problem.

Several favorable reports on the use of lyophile hyperimmune human pertussis serum have appeared in the literature. McGuinness, Bradford, and Armstrong[3] described the preparation of this serum and its value in the prophylaxis and treatment of pertussis. The serum was obtained by bleeding young male adults who had a history of pertussis in childhood. They received three courses of *Hemophilus pertussis* vaccine at four-month intervals and then rested one month before they were bled. The serum was processed by the lyophile method of Flosdorf and Mudd.[4] Agglutination titers of this serum ranged from 1:1,280 to 1:5,120, which were far in excess of those usually noted in patients convalescing from pertussis. In their study eighty-three susceptible children were treated with the serum following exposure and sixty-five failed to develop whooping cough. Of 100 infants and children ill with pertussis and treated with the serum, there was definite clinical improvement in eighty-three, the response was questionable in fourteen, and death occurred in only three. In 1943, McGuinness, Stokes, and Armstrong[5] published a further study on the use of lyophile hyperimmune human pertussis serum, both for prophylaxis and treatment. This report covered a period of eight years and involved 215 children who were treated prophylactically and 315 who were treated therapeutically. The results were comparable to those in their earlier study.

The effect of lyophile hyperimmune human pertussis serum on the humoral antibody titer in pertussis was studied by Katsampes, McGuinness, and Bradford.[6] They observed increased agglutinin titers in patients with pertussis treated with the serum to levels usually associated with convalescence. Of the nineteen patients studied, only six

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had any demonstrable agglutinins before treatment and then only in low titers.

At the Willard Parker Hospital during the period from August, 1942, to June, 1943, twenty-three patients were treated with the lyophile human pertussis serum obtained from the Philadelphia Serum Exchange. This study includes the effect of the serum on the general condition of the patients, on the symptoms of pertussis, on the *H. pertussis* agglutinins, on lymphocytic response in the circulating blood, and on the complicating pneumonia.

These patients were selected for treatment because they were considered critically ill with pertussis as judged by their age, the severity of the attacks of paroxysms, apnea, cyanosis, and emesis, and the presence of pneumonic complications. Only children who were critically ill were treated because funds for the purchase of the serum were limited.

The dried serum, the equivalent of 20 ml. of whole hyperimmune pertussis serum, was dissolved in 10 ml. of sterile distilled water and thus was concentrated by 50 per cent. All dosages referred to are the original volume of serum.

Serum was administered intramuscularly in twenty-two patients; seventeen of these patients received three 20 ml. doses; four received four 20 ml. doses; one received a single 20 ml. dose. Another patient received one 40 ml. dose intravenously, as suggested by McGuinness and associates.[5]

The response of the patients to the hyperimmune human pertussis serum was recorded as good, moderate, questionable, and ineffectual. A good response was characterized by a progressive diminution in the frequency and severity of paroxysms and attacks of cyanosis, apnea, and emesis. This usually began within twenty-four to seventy-two hours following the first injection of hyperimmune human serum. Within three to ten days there were virtually no clinical symptoms of pertussis except for an occasional cough. A moderate response was manifested by a decrease in the symptoms from twenty-four to seventy-two hours after the first injection with a persistence of mild whoop and occasional emesis for from eleven to twenty-five days. The response was considered questionable when little or no change in symptoms occurred in from twenty-four to seventy-two hours after the first injection, and infrequent attacks of cyanosis, whoop, and emesis associated with mild paroxysms persisted from twenty-six to thirty-four days after the first injection. We considered the response ineffectual when there was no improvement in the patient's condition at the end of thirty-four days or when the patient died.

The seventeen patients who received only three 20 ml. doses of hyperimmune human pertussis serum on alternate days improved progressively. Two patients who responded moderately to the three 20 ml. doses of serum suffered relapses four weeks after the first injection of

serum. They were then given a fourth dose of 20 ml. of serum with effective results within ten days. One patient received a fourth dose on the fifteenth day after the first injection because of no response to previous treatment. This patient showed improvement in thirty-six hours. Another patient received a fourth dose on the fifteenth day after onset of serum treatment to prevent the possibility of relapse. Two patients were moribund and died before they could receive the full course of treatment. One of these patients received only one 20 ml. dose intramuscularly; the other received a single 40 ml. dose intravenously.

Table I shows the response to the hyperimmune human pertussis serum according to the age groups of the patients. A good response was obtained in twelve patients, nine of whom were in the 1- to 3-month age group; the other three were less than 1 year old. Six more patients responded moderately and three others had a questionable response. The treatment was ineffectual in two cases.

TABLE I

RESPONSE OBTAINED WITH HYPERIMMUNE HUMAN PERTUSSIS SERUM IN RELATION TO AGE GROUPS

RESPONSE	PATIENTS		AGE GROUPS		
	NUMBER	PER CENT	1-3 MONTHS	6-12 MONTHS	OVER 12 MONTHS
Good	12	52.1	9	3	0
Moderate	6	26.0	2	0	4
Questionable	3	13.3	1	1	1
Ineffectual	2	8.6	0	0	2
Totals	23	100.0	12	4	7

The duration of illness prior to treatment with the hyperimmune human pertussis serum and the response to treatment are shown in Table II. Thirteen patients were treated in the first two weeks of illness; of these, seven had a good response, four, a moderate response, and two, a questionable response. Of the five patients who received treatment during the third and fourth weeks of illness, two had a good response and two a moderate response; the fifth patient died. Another death occurred in the group of three who received serum during the

TABLE II

RELATION OF THE DURATION OF ILLNESS TO RESPONSE OBTAINED WITH THE HYPERIMMUNE HUMAN PERTUSSIS SERUM

WEEKS OF ILLNESS PRIOR TO SERUM TREATMENT	PATIENTS TREATED		RESPONSE TO TREATMENT			
	NUMBER	PER CENT	GOOD	MODERATE	QUESTIONABLE	INEFFECTUAL
1 to 2 weeks	13	56.5	7	4	2	0
3 to 4 weeks	5	21.8	2	2	0	1
5 to 7 weeks	3	13.0	1	0	1	1
8 to 9 weeks	2	8.7	2	0	0	0
Totals	23	100.0	12	6	3	2

fifth to seventh weeks of illness; of the other two, one had a good response and the other had a questionable one. Two patients who were treated as late as the eighth and ninth weeks of illness had good response.

The agglutinin titers were determined before treatment with the hyperimmune human pertussis serum in eleven of twenty-three cases. In no instance was there any demonstrable agglutinins in the blood. At varying intervals after serum therapy ranging from one to forty-five days blood agglutinins were again determined. The titers varied from 1:40 to 1:1600 (Table III).

TABLE III

BLOOD AGGLUTININ TITERS BEFORE AND AFTER THE ADMINISTRATION OF HYPERIMMUNE HUMAN PERTUSSIS SERUM

PATIENT	BEFORE ADMINISTRATION OF HYPERIMMUNE SERUM		AFTER ADMINISTRATION OF HYPERIMMUNE SERUM		RESPONSE TO HYPERIMMUNE SERUM
	DAYS OF ILLNESS	TITER	DAYS AFTER FIRST DOSE	TITER	
R. S.	31	0	1	1:320	Good
			5	1:320	
W. M.	30	0	6	1:380	Good
			23	1:320	
E. G.	8	0	10	1:80	Good
P. E.	63	0	7	1:640	Good
			18	1:640	
J. R.	59	0	15	1:1600	Good
V. M.	31	0	45	1:160	Moderate
G. C.	5	0	1	1:180	Moderate
			3	1:180	
			10	1:160	
			18	1:160	
			30	1:80	
K. H.	21	0	10	1:640	Moderate
E. G.	48	0	3	1:160	Moderate
			10	1:320	
			37	1:320	
P. Y.	13	0	18	1:320	Moderate
			52	1:40	
W. R.	9	0	4	1:160	Questionable
			6	1:160	
			9	1:160	

Lymphocytic blood counts for fifteen of the twenty-three patients treated in our study are tabulated in Table IV. In twelve of the fifteen patients there was substantial reduction in the number of lymphocytes per cubic millimeter within two weeks following the administration of hyperimmune serum.

The most severe complication of pertussis in our patients was pneumonia. The diagnosis of pneumonia was ascertained by roentgen examination and clinical and physical signs. In eleven of the twenty-three patients observed whooping cough was complicated by pneumonia. The day of onset of the pneumonia as related to the onset of the first cough varied from five to sixty days. In eight patients the complicating pneumonia developed prior to the administration of the

TABLE IV

LYMPHOCYTE COUNTS BEFORE AND AFTER THE ADMINISTRATION OF HYPERIMMUNE HUMAN PERTUSSIS SERUM

PATIENT	AGE	WEEK OF ILLNESS	TOTAL LYMPHOCYTE COUNT		RESPONSE TO SERUM
			BEFORE SERUM	AFTER SERUM	
1. D. W.	1 mo.	2	20,315	10,093	Good
2. E. G.	7 mo.	2	28,880	13,880	Good
3. M. J.	3 mo.	4	20,960	6,300	Good
4. A. R.	3 mo.	2	34,170	5,940	Good
5. P. E.	16 mo.	9	5,760	5,390	Good
6. C. M.	7 mo.	4	9,464	8,890	Good
7. J. R.	3 mo.	8	28,688	7,095	Good
8. M. O.	2 mo.	2	23,600	8,760	Good
9. P. Y.	2 mo.	2	37,600	20,700	Moderate
10. V. M.	7 yr.	4	6,450	4,650	Moderate
11. J. W.	1 mo.	2	17,324	8,664	Moderate
12. K. H.	2 mo.	3	18,750	12,096	Moderate
13. G. C.	16 mo.	1	56,760	53,000	Moderate
14. A. C.	5 mo.	2	12,076	7,312	Questionable
15. W. R.	28 mo.	2	48,672	8,970	Questionable

hyperimmune serum. In three patients the first dose of serum was given the day the diagnosis of pneumonia was made. No patient developed pneumonia after the use of hyperimmune serum. The ages of these patients ranged from 2 to 28 months. There were five patients under 1 year of age, five patients in the 1- to 2-year age group, and one patient over 2 years of age.

Chemotherapy was given both prior to and simultaneously with the serum treatments. Sulfadiazine was administered orally to all patients upon the clinical diagnosis of pneumonia without waiting for laboratory reports. In only three of the cultures taken from the pharynx, pneumococci (types V, XIV, and XVIII) were recovered. The concentration of free sulfadiazine in the blood ranged from 5.3 to 10 mg. per 100 ml.

In six of the eight patients treated before the serum was administered, the temperature dropped within thirty-four to seventy-two hours after the onset of the administration of chemotherapy. Two of these patients had a secondary rise in temperature after the drug was withdrawn. However, despite the subsidence of the temperature, the condition of the patients remained critical as judged by their high respiration and pulse rates. The hyperimmune human pertussis serum was then administered and the general condition of the children improved. Five patients improved after the second dose of serum and the sixth after the third dose. The two patients who died received sulfadiazine before serum therapy without results.

The three patients who were treated simultaneously with sulfadiazine and the hyperimmune serum also had a temperature drop within seventy-two hours. However, the condition of one patient remained critical for six days after the first dose of serum, although the other two patients improved in three days.

COMMENT

During the course of pertussis, the patient is subject to exhaustive attacks of coughing, emesis, and apnea. When the paroxysms are frequent, feeding may become a serious problem, resulting in the loss of weight and resistance. The older child is not affected as severely as the young infant in this respect. Any measures which can shorten the protracted course of this disease, or modify it, would be of great value in reducing the mortality, especially in the younger age groups.

The response of the young infants in our series to the hyperimmune pertussis serum was apparently better than in the older children. This may have been due to the fact that the age and weight of the patient were not considered in the dosage given. Sixteen of the twenty-three patients treated in our series were under 1 year of age. None of these infants died. The two children who died were in the 1- to 2-year age group and they were moribund when treatment was begun.

The immunologic studies done in our series indicated that the response to the serum treatment was independent of the titer of the circulating agglutinins. The agglutinin titer had no direct relationship to the dosage of serum. In two cases where the agglutinins were observed thirty and fifty-two days after the first serum dose, the titers decreased to levels usually associated with convalescence.

Tuta[7] suggested that the lymphocytosis in pertussis results from the stimulation of the lymphoid tissue by infection with the *H. pertussis* organism. After serum therapy, there was a reduction in the total lymphocytes from the counts obtained before treatment in the fifteen patients observed. This finding suggests the possibility that the pertussis infection was arrested by the serum.

There is apparently no relationship between the severity of the pertussis symptoms and the pneumonic complication. However, it was observed that the symptoms of pertussis often are reactivated after the pneumonia subsides. In our series the pneumonic complication was considered as an entity and treated as such.

Sulfadiazine was given to pertussis patients with pulmonary involvement. When given alone, chemotherapy resulted in a fall in temperature within twenty-four to seventy-two hours, but the general condition of the patients remained poor. Kohn, Rubin, and Hobart[8] treated pneumonia complicating pertussis with sulfapyridine. They also observed that a drop in temperature did not indicate a clinical improvement. In their study, an extension of the pulmonary involvement was observed with the use of chemotherapy. The pertussis patients with pneumonia, who were treated with hyperimmune serum and sulfadiazine in our series, not only improved clinically but also gave no evidence of extension of the pneumonic process. During our observation of these patients there was no recurrence of pneumonia after resolution of the process. Katsampes and associates[6] reported in their series

that no pneumonia developed after the administration of the hyperimmune human pertussis serum. In twelve of our patients whose conditions were uncomplicated by pneumonia, no pneumonic process was ever observed at any time after the administration of the serum.

SUMMARY

1. Twenty-three patients with pertussis were treated with lyophile hyperimmune human pertussis serum.

2. Twelve of the patients treated were in the 1- to 3-month age group. Seventy-five per cent of these infants had a good response. There were no deaths in this group.

3. Treatment early in the course of pertussis was effective. In addition, two patients treated in the eighth and ninth week of illness had a good response.

4. There were demonstrable circulating agglutinins following the administration of the serum.

5. The lymphocytosis of the blood was suppressed after the administration of the serum.

6. Eleven patients who had pneumonic involvement were treated with the serum in addition to sulfadiazine.

7. There was no extension or recurrence of the pulmonary involvement and no development of pneumonia after a full course of serum therapy.

Mrs. Lillian Buxbaum, Bacteriologist of the Willard Parker Hospital, did the agglutination studies in this series and aided in the formulation of this paper.

We wish to thank Dr. Vera B. Dolgopol, Mr. Herman Ratish, and Dr. Jerome L. Kohn for their helpful suggestions, and Dr. Gertrud Weiss[9] for her suggestions in a preliminary analysis.

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THE SIGNIFICANCE OF SINGLE AND MULTIPLE SHIGELLA INFECTIONS IN INSTITUTIONALIZED CHILDREN

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THROUGH the united efforts of pediatricians, hygienists, and bacteriologists methods have developed which promise to clarify many points concerning dysenteric disorders that occur so frequently in children's homes, asylums, and hospitals. The problem of diarrheic outbreaks is pressing mainly in homes for the feeble-minded due to the bad hygienic habits of mentally deficient children.

Increased emphasis upon the importance of chronic and recurrent cases and recognition of chronic and intermittent carriers permit a better understanding of institutional outbreaks. The use of more suitable media for the detection of the bacillary incitants greatly facilitates the discovery of the human source of the infection. There is also much hope that, as a result of the studies of Neter[1] and Carpenter,[2] order will be created in the taxonomy of dysenteric bacilli belonging to the genus Shigella. According to Neter, these organisms shall be grouped as follows:

I. Mannitol-negative, lactose-negative: *Shigella dysenteriae* Shiga and *Shigella ambigua* Schmitz.

II. Mannitol-positive, lactose-negative: *Shigella alkalescens, Shigella gallinarum, Shigella rettgeri,* and the group called *Shigella paradysenteriae,* including the types of Flexner-Boyd, Strong, and Hiss-Russell.

III. Mannitol-negative, lactose-positive: *Shigella gintottensis.*

IV. Mannitol-positive, lactose-positive: *Shigella sonnei, Shigella equirulis,* and the *Shigella dispar* Castellani subgroup, the latter composed of *Shigella ceylonensis* and *Shigella madampensis.*

Unquestionably, dysentry and dysenterylike diarrhea may be caused by a series of other organisms, such as certain strains of paracolon bacilli, Salmonella, *Proteus morgani,* protozoa, etc., and by a number of chemical, physical, and neurogenic irritants. The present study, however, is solely concerned with dysentery due to microorganisms belonging to the genus Shigella. An attempt is made to parallel the findings in mentally deficient children with the results of the investigations in mentally ill adults who live in institutions of the same State under identical hygienic conditions and who are subject to equal social and medical care.

In spite of the more optimistic outlook for an easier solution of the problem of institutional diarrhea, some questions must still be answered before proper measures can be taken to eradicate "asylum

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dysentery'' from children's hospitals and homes. The most important of these special issues is, from the point of view of the bacteriologist, the occurrence and pathogenicity of some types of dysenteric bacilli, especially members of the *Shigella dispar* group.

Much is known about the relation between age and manifestation of disease in the Salmonella group of enteric microorganisms. Bonaba and associates,[3] Edwards and Bruner,[4] and Bornstein[5] proved conclusively that children react differently than adults to such infections. Moreover, these authors furnished convincing evidence that certain Salmonella types attack only children and young animals. Many Shigella strains, however, have not been evaluated as yet from this point of view.

Shigella types usually found both in children and in adults in this country are *Shigella paradysenteriae, Shigella alkalescens,* and *Shigella sonnei. Shigella ambigua* is rarely reported. Numerous discussions about dysentery with regard to the Shigella strains involved are found in recent literature. Neter[1, 6] gives a comprehensive summary of the present-day state of the Shigella problem. Others report on local outbreaks and on the organisms recovered. From cases and carriers of dysentery in children, Watt and associates[7] cultivated *Sh. paradysenteria* and *Sh. sonnei.* Silverthorne and Walker[8] had similar findings, while Evans[9] isolated only *Sh. sonnei.* Wayburn and associates[10] recovered *Sh. paradysenteriae* from their cases in a carrier-borne outbreak. In South America Hormaeche and associates[11] found that *Sh. paradysenteriae* prevailed and identified less than 10 per cent of their strains as *Sh. sonnei. Shigella ambigua* was found by this group only in 4 per cent of the cases. Vaccaro and associates[12] in Chile and Griehner and Romer[13] in Argentina cultivated mainly *Sh. paradysenteriae* and *Sh. sonnei* from their patients.

Because of the doubt as to their pathogenicity and their relative infrequency, little attention has been paid to the *Sh. dispar* subgroup. Since the publication of Johnston and Kaake,[14] presenting an extensive report on the findings of these organisms in children, no further information became available except that of Yannet and associates,[15] who found *Shigella ceylonensis* in both children and adults. Griehner and Romer[13] isolated *Sh. ceylonensis* but once. Other investigators quoted here do not report any member of the *Sh. dispar* subgroup. Halpern,[16] however, found agglutinins for *Sh. dispar* in the serum of six children but was unable to isolate corresponding organisms from the stools.

Other uncommon Shigella strains are even less often reported. It was not possible to find any recent statement of *Shigella rettgeri, Shigella gintottensis,* or *Shigella gallinarum* being isolated from children.

The Illinois Department of Public Welfare, anxious to exterminate diarrheic disorders from State institutions, established a special bacteriologic service commanded by the Central Enteric Laboratory. Workers of

this laboratory, working in close cooperation with the authorities of the Illinois Department of Public Health, studied the microorganisms isolated from the stools of inmates housed in State institutions of the Greater Chicago area.

The technique used for the examination of fecal and urine specimens was the following:

In accordance with Illinois State regulations, three consecutive authentic posteathartic stool specimens were collected three days to one week apart from newly admitted patients (new admissions) and from inmates housed on wards where diarrhea occurred (survey). For the examination of these samples and for the cultivation of diarrheic feces, five direct plates and one enrichment medium were used: (1) MacConkey's plate;* (2) eosin-methylene blue agar;* (3) S S medium;* (4) Desoxycholate-citrate plate;† (5) Wilson and Blair's agar in the modification of Hajna and Perry;[17] (6) Selenite-F enrichment fluid† streaked after twenty-four and forty-eight hours of incubation to S S medium or to a desoxycholate-citrate plate.

Suspicious colonies were fished to Friewer and Shaughnessy's semisolid lead acetate-lactose tube[18] and to Kligler's agar in Mickle's[19] modification. When the growth showed characteristics of pathogenic organisms, dextrose, mannitol, sucrose, and tryptone broth were inoculated. After twenty-four and forty-eight hours the reactions in the carbohydrates were checked and the indole test performed. Organisms passing this screen test were forwarded to the Central Enteric Laboratory. Here the microbes giving reactions of Salmonella, *Eberthella typhosa*, and *P. morgani* were tested for the respective serologic and biochemical properties.[20, 21] Organisms giving reactions of Shigella were inoculated into milk, gelatin, Voges-Proskauer's medium, and semisolid agar tubes containing sucrose, lactose, dulcitol, rhamnose, and xylose, respectively. Agglutination tests were performed with the growth from agar slants, using live cultures, alcoholized suspensions, and formamide extracts, the latter according to the technique of Gonzales and Otero.[22]

During the year 1943, 309, or 7.3 per cent, of all inmates under 16 years (that is, children) had diarrhea, while only 527, or 3.2 per cent, of the inmates above 16 years (that is, adults) showed such intestinal disturbances. These numbers reveal that in state hospitals with approximately uniform hygienic conditions, food, and medical care, children suffered twice as often from diarrhea as did adults.

Table I shows that 26.2 per cent of the diarrheic stools from children contained Shigella, while such organisms were present in only 5.5 per cent of the diarrheic stools from adults. Newly admitted children showed also a far higher rate (14.4 per cent) of Shigella carriers than adults (0.3 per cent). Children who were exposed to contact with cases

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TABLE I

CASES AND CARRIERS OF ENTERIC ORGANISMS ISOLATED IN ILLINOIS STATE HOSPITALS OF THE GREATER CHICAGO AREA DURING 1943

	NUMBER						PER CENT					
	CASES		NEW ADMISSIONS		SURVEY		CASES		NEW ADMISSIONS		SURVEY	
	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS
Total examined	309	527	181	3,238	723	819	100	100	100	100	100	100
No "enteric" microbes found	170	374	128	3,157	535	744	58.9	73	70	98.3	73.7	91
Salmonella present	1	25	8	28	0	8	.3	4.7	4.4	.8	0	.9
E. typhosa present	0	1	0	5	0	0	0	.2	0	.1	0	0
P. morgani present	57	98	19	18	31	39	14.6	16.6	10.4	.5	4.6	4.7
Shigella present	81	29	26	10	157	28	26.2	5.5	14.4	.3	21.7	3.4

of diarrhea (survey) proved to excrete Shigella more often (21.7 per cent) than adults (3.4 per cent).

Table II demonstrates the distribution of shigella strains observed in the year 1943. The high number of *Sh. ambigua* infections in children can be attributed to an epidemic in a Children's Hospital, while institutes for adults remained free from outbreaks during this year. The occurrence of many *Sh. alkalescens* and *Sh. sonnei* carriers can be explained by the prevalence of such infections during the last years. No direct explanation is at hand, however, for the presence of a great number of *Sh. ceylonensis* and *Shigella madampensis* strains, mainly among children and newly admitted patients. It is evident from Table III that these organisms appeared most often associated with other Shigella types. *Sh. sonnei* was likewise found frequently in combination with other Shigella strains.

Additional less common shigella strains detected in the course of this investigation include the following observations:

Sh. gallinarum. While *Bergey's Manual of Determinative Bacteriology*[23] lists this species with Shigella, Edwards and Bruner[4] and Bornstein[5] classify it with the genus Salmonella because of its serologic characteristics and epidemiologic behavior. These authors consider *Sh. gallinarum* a nongas-forming variant of *Shigella pullorum.* This organism is but rarely found in man.[20]

The patient from whom *Sh. gallinarum* was isolated was a 10-month-old Negro boy. Nothing is known about his mother. His father left him in a general hospital, from which he was transferred to a State institute. The boy developed bronchopneumonia on the admission ward and died shortly. No autopsy was performed. The stool specimens collected on admission revealed *Sh. sonnei* and *Sh. gallinarum.*

Sh. rettgeri. Sh. rettgeri was first isolated from a cholera-like epidemic among chickens.[23] Edward classifies *Sh. rettgeri* with the paracolon organisms.[24] The microbes isolated in our cases showed the characteristics of the type strain except that they produced a very mucous growth and gave rise to motile daughter colonies. According to St. John-Brooks and Rhodes,[25] *Sh. rettgeri* is agglutinated by sera prepared against *Sh. paradysenteriae* type Y. The strains observed by us did not conform to this requirement.

One patient harboring this organism was a 14-year-old white girl with epilepsy who was admitted from a small rural community close to Chicago. The organism was isolated only from the first stool specimen collected shortly after admission.

The other patient harboring *Sh. rettgeri* was a white 17-year-old boy, an inmate of a Children's Hospital. The whereabouts of his parents were unknown. He had suffered of bacillary dysentery caused by *Sh. sonnei* one year before, was treated with sulfathiazole, and was considered cured. During the present survey both *Sh. sonnei* and *Sh. rettgeri* were isolated from the feces.

TABLE II

DISTRIBUTION OF SHIGELLA STRAINS OBSERVED IN STATE HOSPITALS OF THE GREATER CHICAGO AREA DURING 1943

	NUMBER OF STRAINS									PER CENT OF STRAINS								
	CASES		NEW ADMISSIONS		SURVEY		SUM		TOTAL	CASES		NEW ADMISSIONS		SURVEY		SUM		TOTAL
	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS		CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	
Sh. ambigua	42	3	5	0	52	1	99	4	103	47.5	9.7	14.3	0	29.4	3.3	33	5.6	27.7
Sh. paradysenteriae V	3	0	0	1	5	1	8	2	10	3.3	0	0	10	2.8	3.3	2.7	2.9	2.8
Z	3	1	2	1	10	1	15	3	18	3.3	3.2	5.7	10	5.7	3.3	5	4.2	4.8
88	1	2	0	0	0	0	1	2	3	1.1	6.5	0	0	0	0	.3	2.9	.8
103	4	0	1	0	10	5	15	5	20	4.4	0	2.9	0	5.7	16.7	5	7	5.5
Sh. alkalescens	5	5	8	1	16	10	29	16	45	5.6	16.1	22.9	10	9	33.4	9.6	22.4	12.5
Sh. gallinarum	1	0	0	0	0	0	1	0	1	1.1	0	0	0	0	0	.3	0	.2
Sh. rettgeri	0	1	1	0	0	0	1	1	2	0	3.2	2.9	0	0	0	.3	1.4	.5
Sh. gintottensis	0	0	0	0	1	0	1	0	1	0	0	0	0	.6	0	.3	0	.2
Sh. sonnei	27	14	10	4	57	11	94	29	123	30.5	45.1	28.5	40	32.2	36.7	31.3	40.9	33.1
Sh. equirulis-like	0	0	0	1	1	0	1	1	2	0	0	0	10	.6	0	.3	1.4	.5
Sh. ceylonensis	1	3	5	1	16	1	22	5	27	1.1	9.7	14.3	10	9	3.3	7.3	7	7.2
Sh. madampensis	2	2	3	1	9	0	14	3	17	2.2	6.5	8.5	10	5	0	4.6	4.2	4.6
Sum	89	31	35	10	177	30	301	71	372	100	100	100	100	100	100	100	100	100

Table III

Single and Multiple Infections With Shigella Observed in State Hospitals in 1943

	NUMBER OF PERSONS INFECTED								
	CASES		NEW ADMISSIONS		SURVEY		SUM		TOTAL
	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	CHILDREN	ADULTS	
Single Infections									
Sh. ambigua	39	3	1	0	44	1	84	4	88
Sh. paradysenteriae V	3	0	0	1	3	0	6	1	7
Z	3	1	1	1	10	1	14	3	17
88	1	1	0	0	0	0	1	1	2
103	3	0	0	0	4	4	7	4	11
Sh. alkalescens	3	5	6	1	14	8	23	14	37
Sh. rettgeri	0	0	1	0	0	0	1	0	1
Sh. equirulis-like	0	0	0	1	0	0	0	1	1
Sh. sonnei	19	13	6	4	48	11	73	28	101
Sh. ceylonensis	1	3	3	1	8	1	12	5	17
Sh. madampensis	1	1	2	1	7	0	10	2	12
Sum	73	27	20	10	138	26	231	63	294
Double Infections									
Sh. ambigua and *paradysenteriae* Z	0	0	1	0	0	0	1	0	1
Sh. ambigua and *paradysenteriae* 103	0	0	1	0	1	0	2	0	2
Sh. ambigua and *gintottensis*	0	0	0	0	1	0	1	0	1
Sh. ambigua and *sonnei*	3	0	0	0	3	0	6	0	6
Sh. ambigua and *ceylonensis*	0	0	0	0	2	0	2	0	2
Sh. ambigua and *madampensis*	0	0	0	0	1	0	1	0	1
Sh. paradysenteriae V and *alkalescens*	0	0	0	0	0	1	0	1	1
Sh. paradysenteriae 103 and *alkalescens*	0	0	0	0	0	1	0	1	1
Sh. paradysenteriae V and *sonnei*	0	0	0	0	2	0	2	0	2
Sh. paradysenteriae 103 and *sonnei*	1	0	0	0	2	0	3	0	3
Sh. paradysenteriae 103 and *ceylonensis*	0	0	0	0	2	0	2	0	2
Sh. paradysenteriae 88 and *madampensis*	0	1	0	0	0	0	0	1	1
Sh. alkalescens and *sonnei*	1	0	2	0	1	0	4	0	4
Sh. alkalescens and *ceylonensis*	0	0	0	0	1	0	1	0	1
Sh. sonnei and *gallinarum*	1	0	0	0	0	0	1	0	1
Sh. sonnei and *rettgeri*	0	1	0	0	0	0	0	1	1
Sh. sonnei and *madampensis*	1	0	0	0	0	0	1	0	1
Sh. ceylonensis and *equirulis*-like	0	0	0	0	1	0	1	0	1
Sh. ceylonensis and *madampensis*	0	0	0	0	1	0	1	0	1
Sum	7	2	4	0	18	2	29	4	33
Triple Infections									
Sh. ambigua, alkalescens, and *sonnei*	1	0	0	0	0	0	1	0	1
Sh. ambigua, sonnei, and *ceylonensis*	0	0	1	0	0	0	1	0	1
Sh. paradysenteriae 103, *sonnei,* and *ceylonensis*	0	0	0	0	1	0	1	0	1
Sh. sonnei, ceylonensis, and *madampensis*	0	0	1	0	0	0	1	0	1
Sum	1	0	2	0	1	0	4	0	4
Per Cent Distribution									
Single infections	90.5	93.8	76.9	100	88.6	93.6	87.7	94.1	89.5
Double infections	8.6	6.2	15.5	0	10.8	6.4	10.8	5.9	9.4
Triple infections	1.9	0	7.7	0	.6	0	1.5	0	1.1
Total number of infected persons	81	29	26	10	157	28	264	67	331

Sh. gintottensis. Sh. gintottensis was first found in diarrheic stools by Castellani and Chalmers.[26]

Our patient harboring *Sh. gintottensis* was a 9-year-old mentally deficient boy from the near North side of Chicago, who had a recurring diarrhea for six years but was symptomless for the last two years. During the present survey he was found to harbor both *Sh. ambigua* and *Sh. gintottensis.*

Sh. equirulis-like organisms, without the typical R-S variation described by Edwards,[27] were found in an adult recently admitted from the near North side of Chicago. He did not have diarrhea.

Similar organisms were also detected in the feces of a 12-year-old boy from the same Chicago neighborhood. This boy had recurring diarrhea considered as chronic bacillary dysentery since his admission to the institute and was treated accordingly. No symptoms were observed during the last months but *Sh. ceylonensis* and an *Sh. equirulis*-like organism were isolated from the stools.

Due to difficulties usually encountered in securing sufficient blood for detailed serologic studies from persons with mental disorders, only a limited number of carriers and patients could be examined in a satisfactory manner. In this part of the present study, special emphasis was laid upon double and triple carriers because of the absence of reports on serologic investigation of such persons in the literature.

Whenever possible, the agglutination reactions were performed with organisms isolated from the stools of the carrier in question. In other instances antigens prepared from strains of known agglutinability were used. In the case of *Sh. ambigua,* two strains with different antigenic power were applied. The results of the experiments are given in Table IV.

The investigations of Boyd,[28] Glynn and Starkey,[29] Carpenter,[2] Halpern[16] and others confirmed the existence of cross reactions among Shigella strains. Our results, however, show in addition to these observations, that the agglutination of strains belonging to the *Sh. dispar* subgroup do not reach a level above 1:40, thus precluding the possibility of using the reaction for diagnostic purposes. The formamide one-tube test proved valuable in persons excreting *Sh. ambigua* and *Sh. paradysenteriae* but varied in carriers of *Sh. alkalescens* and *Sh. sonnei.* The same observations were made in carriers and patients infected with a single strain of Shigella. No difference was noted in chronic cases and chronic carriers.

DISCUSSION

Children sheltered in Illinois State hospitals of the greater Chicago area suffered twice as often of diarrhea as did adults housed in similar asylums. Shigella strains were found to be the causative agents of enteric disturbances in inmates below 16 years of age more frequently than in older persons. All types of Shigella encountered during the study had a marked tendency to establish a carrier status in a large

TABLE IV

AGGLUTINATION TESTS WITH SERA OF PERSONS EXCRETING TWO AND THREE TYPES OF SHIGELLA

NUMBER	CHARACTER	TYPE OF SHIGELLA IN STOOL	AGGLUTINATED WITH ALC. ANTIGEN (10×) TO TITER														POSITIVE WITH FORMAMIDE EXTRACT OF
			DY	AMB		PARADYSENTERIAE						AL	SONNE		CEY	MAD	
				I	II	V	W	X	Z	103	119		I	II			
1.	Child (carrier)	Amb—para Z	2	16	8	32	32	64	64	64	8	64	0	0	0	0	Amb I, para Z
2.	Child (case)	Amb—sonne I	8	32	16	8	4	0	0	4	0	8	2	4	2	4	Amb I-II
3.	Child (carrier)	Amb—sonne II	4	32	32	4	8	2	4	16	8	16	16	32	4	4	Amb I-II
4.	Child (carrier)	Amb—cey	4	16	4	2	2	0	4	4	2	4	4	4	0	0	Amb I
5.	Child (carrier)	Amb—cey	4	32	16	0	0	2	2	0	4	2	2	4	2	0	Amb I-II
6.	Child (carrier)	Amb—mad	8	64	16	0	0	0	2	4	4	2	0	0	0	0	Amb I-II
7.	Adult (carrier)	Para V—alk	0	0	0	32	16	8	16	32	16	64	0	0	0	0	Para V, 103 alk
8.	Adult (case)	Para 88—mad	0	0	0	16	16	8	8	16	16	8	0	0	0	0	Para 103, 119
9.	Adult (carrier)	Para 103—alk	0	8	4	4	16	8	16	16	32	32	4	0	0	0	Para Z, 103, 119, alk
10.	Child (carrier)	Para V—sonne I	2	0	0	32	8	16	8	4	2	8	8	8	2	2	Para V
11.	Child (carrier)	Para V—sonne II	0	0	0	16	8	4	16	8	4	16	8	4	0	2	Para V, alk
12.	Child (carrier)	Para 103—sonne I	0	0	4	0	0	2	0	4	8	4	8	4	0	2	None
13.	Child (case)	Para 103—sonne I	0	0	0	8	4	16	8	8	16	16	2	8	0	0	Para X, 103 alk
14.	Child (carrier)	Para 103—sonne II	0	8	2	16	4	8	8	16	16	16	8	16	2	4	Para X, 103 alk
15.	Child (carrier)	Sonne I—alk	0	0	0	8	4	8	16	8	8	16	0	2	0	0	Para Z, alk
16.	Child (carrier)	Sonne II—alk	0	0	0	2	4	2	4	8	8	8	4	4	2	4	None
17.	Child (carrier)	Sonne II—alk	0	0	0	2	4	0	16	4	16	16	4	4	2	4	Para Z, alk
18.	Child (case)	Sonne II—mad	2	0	4	4	2	2	4	2	4	2	2	8	4	4	Sonne II
19.	Child (carrier)	Alk—cey	0	0	0	4	2	2	4	8	0	4	2	2	0	0	None
20.	Child (carrier)	Amb, sonne, cey	0	8	16	2	4	2	0	2	0	8	2	8	4	4	Amb II
21.	Child (carrier)	Sonne I, cey, mad	0	0	0	0	0	0	0	0	0	0	2	4	4	4	None

Dy, *Sh. dysenteriae* Shiga.
Amb, *Sh. ambigua* Schmitz.
Para, *Sh. paradysenteriae* Flexner-Boyd.
Al or Alk, *Sh. alkalescens.*
Sonne, *Sh. sonnei.*
Cey, *Sh. ceylonensis.*
Mad, *Sh. madampensis.*

percentage of children. The rate of such carriers proved to be far higher in newly admitted children than in adults who were recently committed to a State hospital. Moreover, many children harbored two or three Shigella strains, while adults only exceptionally revealed multiple infections. Such double and triple carriers, who are but seldom mentioned in the literature, were found not only in the chronically institutionalized population where contacts with persons excreting different types of Shigella appeared frequently, but also they were discovered among newly admitted children. It can be concluded that multiple infections are not as infrequent as believed in the general population, even if the accumulation of such carriers among new admissions to State institutes can be explained in part by unhealthy home conditions and bad personal hygienic habits of those who are sent to State asylums and hospitals. The lower resistance to infection and the greater aptitude toward acquiring a carrier status of the younger age group can be assumed in view of the fact that adults, admitted from similar unsanitary environments and displaying the same laxness toward personal cleanliness, are less frequently infested with Shigella.

The significance of the high carrier rate of *Sh. ceylonensis* and *Sh. madampensis* is debatable, as the pathogenicity of these organisms is not established as yet. Neter[1, 6] does not declare them to be pathogenic. Castellani[30] and Cerruti,[31] who first reported cases of dysentery originated by these organisms, credited *Sh. dispar* with pathogenic power. Grichner and Romer,[13] who found *Sh. ceylonensis* in one case, consider this microbe to be of "doubtful pathogenicity." In this study, members of the *Sh. dispar* group were isolated in a number of instances, but only on rare occasions from acute diarrheas where no other organism of known pathogenicity was present. This circumstance, together with the high incidence of *Sh. dispar* strains found simultaneously with other Shigella types in children who chronically excreted dysenteric organisms, tends toward the conclusion that *Sh. ceylonensis* and *Sh. madampensis* play but a secondary role in enteric infections.

Sh. rettgeri and Shigella (Newcastle), being motile, should not be classed with Shigella. The two instances in which *Sh. rettgeri* was recovered in this study do not permit one to judge as to the pathogenicity of this organism.

Sh. gintottensis is not considered as pathogenic either by Neter[1, 6] or by D'Antoni.[32] The findings in our case point in the same direction. Similar conclusions can be drawn concerning the equirulis-like microbes observed in this study.

Serologic tests failed to show antibody formation to a diagnostic level in persons excreting *Sh. ceylonensis* and *Sh. madampensis*. Attempts to demonstrate a differentiation of subclinical infection from the carrier status were in vain. Both conditions, however, might exist without evident serologic responses. The use of alcohol-treated antigens and formamide extracts lowered the cross-reactions in Shigella infections but

could not throw light upon the character of infections with lactose-fermenting Shigella organisms.

The observations made in this study strongly suggest the necessity of investigating diarrheic disturbances in children's institutes. Not even the high number of children harboring Shigella permits us, however, to regard these bacteria as the sole sources of dysenteric or dysentery-like outbreaks. Salmonella infections, certain strains of paracolon bacilli,[33] protei,[34] and protozoa will likewise take their toll. Only permanent vigilance over all possible routes of "enteric" infections, carriers, food, flies, will prevent diarrheic disorders.

SUMMARY

Three hundred seventy-two strains of Shigella were isolated from 331 inmates of State institutes of the greater Chicago area during 1943. New admissions to children's hospitals yielded 14.4 per cent carriers and hospitals for adults, 0.3 per cent carriers.

Chronically institutionalized children harbored Shigella in 21.7 per cent of the examined cases; 3.4 per cent of the specimens of mentally ill adults contained these organisms.

Double and triple carriers occurred in 12.3 per cent of children harboring Shigella and in 5.9 per cent of the adults.

The recovery of less common Shigella types, as *Sh. ceylonensis, Sh. madampensis,* and *Sh. gintottensis,* and of organisms erroneously classified *Shigella,* as *Sh. gallinarum* and *Sh. rettgeri,* are discussed. *Sh. gintottensis, Sh. equirulis*-like organisms, and microbes of the *Sh. dispar* subgroup, namely, *Sh. ceylonensis* and *Sh. madampensis,* do not seem to have importance other than that of secondary invaders.

Serologic reactions failed to reveal agglutinin production to a significant level for lactose-fermenting Shigella in double and triple carriers. In infections with other Shigella, the use of alcohol-treated antigens and formamide extracts with the one-tube technique gave satisfactory results.

The authors are greatly indebted to Dr. E. R. Neter, of the Children's Hospital, Buffalo, Dr. P. R. Edwards, of the University of Kentucky, and Dr. P. L. Carpenter, of the Rhode Island State College, for their helpful suggestions, valuable criticism, and aid in the identification of unusual strains. They are equally grateful to Dr. C. S. Sommer, Director of the Mental Hygiene Service of the Illinois Department of Public Welfare, and Dr. N. M. Dorris, Chief of the Mobile Unit of the Illinois Department of Public Health, for constant support and stimulation in their work. A grant from the Nutrition Research Laboratories of Chicago greatly facilitated this study.

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SPONTANEOUS SUBARACHNOID HEMORRHAGE IN INFANTS AND ITS RELATION TO HYDROCEPHALUS

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BLOOD in the spinal fluid of the newborn infant usually occurs as the result of birth trauma but occasionally is due to hemorrhagic disease. These conditions are well established during the first week. Exception may occur in the occasional subarachnoid bleeding secondary to a subdural hemorrhage. Textbooks do not again refer to subarachnoid hemorrhage until the age of childhood. Such bleeding at this time not associated with disease, injury, or blood dyscrasia is usually due to the rupture of a cerebral aneurysm or other vascular defect.

The following three protocols represent cases of spontaneous hemorrhage occurring in infants between the ages of 18 and 30 days of age. The bleeding apparently developed suddenly without evidence of hemorrhage at any other point. Symptoms or signs of disturbances other than those explained by meningeal irritation were wanting. Subsidence of the bleeding occurred promptly in all cases. Asymptomatic hydrocephalus occurred in two of the patients following their hospital discharge. Evidence of acute infection, scurvy, purpura, hemophilia, or leucemia was not obtained in any of the cases. Hemorrhagic disease of the newborn infant seemed unlikely in view of its proved relationship with the prothrombin reduction occurring in the first few days of life.

REPORT OF CASES

Case 1.—M. H., a first-born male weighing 9½ pounds, was born on July 19, 1938, after a fairly hard labor terminated by forceps. The baby was in good condition and no untoward neonatal disturbances were reported. On the twenty-fifth day of life, at 7:45 P.M. a generalized convulsion occurred. The head became retracted and feedings were refused. There was no fever or vomiting but convulsions recurred and on the following day the baby was admitted to Doernbecher Hospital for Children. On admission the infant weighed 9 pounds, 6 ounces; temperature was 101.6° F. The head was retracted and pallor, marked. Convulsive movements of extremities occurred when the baby was disturbed. There was no evidence of infection. Spinal tap revealed bloody spinal fluid under increased pressure which appeared to darken as it was withdrawn. The urine was normal. Blood count revealed a hemoglobin of 9.2 Gm., red cell count of 3.33 million, and a white cell count of 13,900 with a normal differential. Clotting time was five minutes and bleeding time was seven minutes. Platelets numbered 210,000. The nervous system became less irritable during the next two days and convulsions ceased. Some sedation and several spinal punctures, which all revealed uniformly bloody fluid, were the only treatments used during this time. A transfusion was given on the third hospital day. In a few days the infant was discharged apparently well. Soon after this his head was noted to be enlarging. The circumference measured 17¾ inches

compared to a birth measurement of 15 inches. The head continued to grow and by 1 year of age had reached 23½ inches. There were no untoward reactions from this, other than delay in his physical activity. Cranial growth slowed at this time and at 5 years of age the circumference of his head had increased to only 25½ inches. The fontanel closed at 15 months. Although words were said soon after 1 year, he did not walk until the age of 2 years. He is not as active as other boys, but handles his head very well considering its massive size. Intelligence does not seem to be impaired.

Fig. 1.

Fig. 2.

Fig. 1.—M. H. at 9 months showing definite hydrocephalus.
Fig. 2.—M. H. at 3½ years showing an arrested hydrocephalus measuring 24½ inches in circumference.

CASE 2.—R. H., a full-term infant weighing 8½ pounds, was born without difficulty on July 11, 1943. He is the third child of healthy parents and the younger brother of M. H., whose history is given in Case 1. The second brother developed without incident. No family history of similar disturbances or unusual conditions has been elicited. Parental Wassermann tests have been negative.

His neonatal course was without event. At 1 week of age a blood count was normal and bleeding and clotting times were two and one-half and three and one-half minutes, respectively. Weight gain was slow due to insufficient breast milk.

On the eighteenth day of age, R. H. became pale and refused his feedings. The following morning he went into a generalized convulsion. He was seen at my office in consultation with Dr. H. R. Shields. He weighed 8 pounds, 6 ounces and temperature was 98° F. Pallor was marked and a general hypertonicity was present. His cry was shrill. The fontanel was tense and bulging. No evidence of infection was found. He was admitted to Good Samaritan Hospital where his convulsions continued at frequent intervals in spite of heavy sedation. Spinal tap on admission produced 10 c.c. of uniformly bloody fluid. Culture showed no growth. Blood examination revealed a hemoglobin of 9.66 Gm., a red count of 2.33 million

and a white cell count of 13,700 with a normal differential. An ampule of vitamin K was given. After two days the convulsions ceased, nursing improved, and child appeared normal. On the fifth hospital day he was discharged in good condition. No fever had been noted. The head measured 15¼ inches. At 5 months of age his head measured 17¾ inches but he was a large boy and weighed 16 pounds, 10 ounces. At the present writing his fontanel is small and there is no evidence of physical abnormality.

Fig. 3.—R. H. at 5½ months showing normal head.

CASE 3.—D. E., a female infant weighing 7 pounds, 13 ounces, was born without difficulty on Feb. 22, 1943. She was the second girl of healthy parents. There were no unusual family diseases. Neonatal period was uneventful. She took her formula well and reached her birth weight in ten days. At 3 weeks of age she developed a simple cold.

On March 27, 1943, at 1 month of age, she was brought to my office at the request of Dr. Harold Palmer with the complaint of increasing drowsiness and refusal of milk. On examination her temperature was 99.8° F. and weight was 7 pounds, 13 ounces. She exhibited marked lethargy and no interest in her surroundings. The skin was pallid. There was a general rigidity of her extremities. Fontanel was tense and bulging. She was admitted to the Dornbecher Hospital for Children where fluid, the consistency of blood, was removed from the spinal canal. The cells were crenated and the supernatant fluid strongly xanthochromic. Blood count showed a hemoglobin of 13.5 Gm.; red cells, 5.2 million; white cells were 14,500 with a normal differential. Bleeding time was two minutes and clotting time was five minutes, thirty seconds. Serology was negative. The infant gradually recovered after several more spinal drainages of bloody fluid. She was discharged with the spinal fluid having cleared. Three and one-half weeks after the onset of the illness, the child was seen to have an enlarging head with a tense fontanel and a head measurement of 16½ inches compared to a chest measurement of 14 inches. Within two months the head circumference had reached 20 inches and the child was readmitted to the hospital. An encephalogram demonstrated all ventricles enlarged with no air over the cortex. A diagnosis of communicating hydrocephalus was made with probable obstruction to the flow of cerebrospinal fluid at the base of the brain. Cauterization of one choroid plexus was achieved. A stormy postoperative course followed with the eventual death of the child from bronchopneumonia. Autopsy revealed an enormous head which collapsed on incision. The

cortex measured only 3 mm. in thickness, all the ventricles were greatly enlarged and a gelatinous material covered the cerebellum. The point of previous bleeding was not found. Study of the meninges, unfortunately, was not accomplished.

Fig. 4.—Comparative encephalograms of D. E. at one-month intervals showing the rapid enlargement of her communicating hydrocephalus.

DISCUSSION

These three cases are of interest in as much as the patients all developed hemorrhage into the spinal fluid with evidence of increased intracranial pressure during the age of from 18 days to 30 days of life. They had all been discharged from their maternity hospital in good condition. The bleeding subsided in all three within a few days of the onset. No cause for their bleeding has been determined. Two of the three developed hydrocephalus. Of these, one succumbed from pneumonia after operation was attempted to cauterize the choroid plexus; the other, now 5 years of age, has an arrested hydrocephalus of considerable size.

Spontaneous subarachnoid hemorrhage has received considerable attention in the literature of recent years. It occurs in children about as regularly as in adults and although death and residual paralysis are common, approximately 50 per cent recover completely. The cause is generally due to a rupture of a congenital defect in a cerebral vessel. This is presumed to be the cause in the cases reported since disease and dyscrasia were ruled out. Two of the cases occurring in siblings lend support to the belief that a congenital weakness of the vessels is a causative factor. Such hemorrhage in infants is almost unmentioned in the literature. The following two cases here briefly outlined are reports of patients who suffered from a similar leakage of blood from cerebrovascular anomalies during the same age period.

Bagley,[1] reports an infant who developed bleeding in the subarachnoid space at 15 days of age. Convulsions and head retractions were the principal symptoms. Spinal drainage failed to clear the bleeding. At autopsy dilated ventricles were found. A large venous plexus over the cerebellum was apparently the source of bleeding.

Merwarth and Freidman[2] reported a child 5 weeks old who suddenly developed vomiting and turning of the head to the right with eyes projected downward. Bloody spinal fluid was removed with gradual improvement in the patient. Temperature was mildly elevated. Wassermann, bleeding and clotting times, and blood counts were normal. At 3½ months of age considerable increase in head size was noted. One choroid plexus was removed, but the infant died within a few days. Autopsy showed an enlarged head with enlarged ventricles. The bleeding was thought to come from an angioma in the thalamus. The subarachnoid and pial membranes were matted together over much of the brain.

Barber[3] presented a child who suddenly developed a spontaneous subarachnoid hemorrhage at the age of 5 months. Death occurred within twenty-four hours. The patient exhibited profound shock and flaccidity of musculature. Barber reviewed 230 case reports of spontaneous hemorrhage at that time (1936). The youngest of these was 17 months old.

It appears that such a catastrophe is far more dangerous in infants than in the older age group. Not only do they risk the danger of hemorrhage, but also the extreme likelihood of an acquired hydrocephalus.

That hemorrhage can produce adhesions between pia and arachnoid membranes and interfere with the cerebrospinal circulation is very likely. Bagley[4] has shown that blood introduced into the spinal fluid of dogs not only causes neurologic disturbances from changes in behavior to severe convulsive seizures, but also that the meningeal irritation thus produced results in the formation of fibrous tissue. That scarring and thickening of the meninges interfered with the circulation of the spinal fluid or at least its absorption is evident when post-mortem examination of these dogs showed uniform dilation of the ventricles.

The case of Merwarth and Freidman,[2] previously referred to, demonstrated the hydrocephalus to have resulted from similar meningeal reaction and adhesions. That such a situation occurred in Cases 1 and 3 seems likely.

In view of the frequency with which the blood is found in the spinal fluid of the newborn infant, it is surprising that hydrocephalus does not develop more frequently. A high immediate mortality in those with significant bleeding would appear to be a determining factor. Bagley[4] reports several instances of hydrocephalus from this cause occurring in infancy. Jacobs[5] also reported a case of hydrocephalus following a hemorrhage in a newborn infant. The resulting adhesions producing

the block were successfully removed surgically. Further study of hydrocephalus might very well show that meningeal reaction resulting from hemorrhage is the chief cause of acquired head enlargement. Large-headed children, who are often slow in development, may have suffered a mild obstruction to the absorption of the spinal fluid from this cause. Arrest of hydrocephalus should occur more easily after the reaction of bleeding than from the correction of an error in development. So-called unrecognized meningitis which is mentioned as a frequent cause of acquired hydrocephalus may well fall into this group.

From these observations on spontaneous subarachnoid hemorrhage in infancy it would appear that free drainage of bloody spinal fluid should be instituted. The temporary replacement of the fluid by air would be ideal if the bleeding has stopped. Appropriate treatment of nervous irritability and possible shock is in order. If hydrocephalus does develop there is possibility of an early arrest, and that failing, the consideration of neurosurgical procedure is in order.

SUMMARY

1. Three cases of spontaneous subarachnoid hemorrhage in infants occurring between the ages of 18 and 30 days accompanied by severe neurologic symptoms are reported.

2. The bleeding spontaneously subsided although the cause was not determined in any of the cases.

3. Hydrocephalus developed in two of the cases presumably from the reaction of the blood on the meninges with resultant adhesions and obstruction to the free flow of cerebrospinal fluid.

4. It is suggested that unrecognized subarachnoid hemorrhage at birth is a likely cause of varying degrees of hydrocephalus.

5. Prompt and complete removal of blood may offer the best chance of avoiding acquired hydrocephalus from such hemorrhage.

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AN ANALYSIS OF CHILDREN'S EATING HABITS

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THE Samuel S. Fels Research Institute is engaged in a long-term serial growth study of an unselected group of children. Various aspects of the children's growth and maturation are studied: physical development, psychologic development, and characteristics of the environments as they affect the child.

The present study will report some of the findings on the relationship of a child's eating habits, his home background, and his social adjustment.

A group of seventy-six mothers were interviewed about the eating habits of their children. This interview was conducted as a part of a routine nutrition interview by a nutritionist familiar to each of the parents. On the basis of these interviews and supplemented by the interviewer's general knowledge of the child each subject in the study was traced on three variables: *appetite, finicalness,* and *table behavior.*

In arriving at a rating of the child's *appetite,* the following behavioral symptoms were taken into consideration: the amount of food eaten by the child, the consistency of his appetite, speed of eating, and frequency of food between meals. The most important symptom was the amount of food eaten.

The *finicalness* of each child was rated in terms of his likes and dislikes of specific foods and his resistance to new foods, new methods of preparation, and to details of preparation. The rating of finicalness was primarily a measure of emotional attitude toward certain types of food rather than a measure of the amount of food eaten.

Table behavior was defined to include manners, distractability, conversation at table, dawdling, spilling, cheek-packing. It represented the extent to which the child conformed to the socially accepted rules for behavior at the table.

On each of the variables, a majority of the children were rated "unsatisfactory." According to the judgment of the interviewer, 53 per cent of the children have poor appetites and 42 per cent have good ones; 65 per cent of the children show poor table behavior, while 35 per cent have good table behavior; and a majority of the children, 56 per cent, are unreasonably finical. Twenty-seven per cent of the children are unsatisfactory on all three scales simultaneously. Most of the children in this last group are considered by their parents and the interviewer to be "feeding problems." This fact is an interesting one from the standpoint of the pediatrician, who must evaluate mothers' statements

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that their children are "feeding problems." There are, however, only ten children in the group of seventy-six who are so maladjusted in their eating habits that they are severe feeding problems.

There is a tendency for all three variables to be related. That is, a child who has poor appetite is likely to be finical and to have poor table behavior. Of the forty children with poor appetite, thirty-three also show poor table behavior. And of those thirty-three, twenty are also finical. On the other hand, this correlation between the types of feeding problems is not so great that it is unimportant to distinguish between the types of problems. The classification of children into two groups, feeding problems and satisfactory eaters, is too crude. It hides important information about the type of eating difficulty and the origins of the problem.

Table behavior and appetite are very closely related to each other, and, as will appear later, they are influenced by the same general type of home environment. The difference between them lies in the fact that good table behavior is attained with more difficulty than is good appetite. Consequently there are fewer children with good table behavior than with good appetite. The children with good table behavior form a subgroup of the children with good appetite. There are almost no cases of good table behavior without good appetite, but there are a number of children with good appetite but without good table behavior.

Finicalness, on the other hand, is not closely related either to appetite or table behavior. Both good and poor appetites can be found in children who are finical and also in children who are not finical. The two variables seem sufficiently independent to warrant separating them in the study. It will appear later that finicalness is related to a quite different kind of home environment than is either appetite or table behavior.

It was possible to study the relation of the home environment to the eating habits of the children because routine home visits are included as a part of the Fels research program. The home visitor visits each home twice a year, during which she observes the child and makes an appraisal of his home environment.

The homes of children with good appetites seem to be characterized as follows. Discipline is usually strict, infractions of rules are severely punished, and considerable parental coercion is exerted. Along with this severity, however, the children seem to be accepted and approved. They are praised for conformity and the general attitude of the parents reassures the child that he is loved and accepted even if punished. Parents who generally disapprove or reject their children are likely to meet rebellious behavior at meal times.

The homes of children with good table behavior seem also to be of this strict, coercive, yet acceptant, type. They seem to be more strict

and severe and perhaps less acceptant than are homes of the children with good appetites.

Earlier in this report it appeared that children with good table behavior tend also to have good appetites. This finding in connection with the fact that both types of children come from coercive homes seems to imply that the parents of such children are trying to coerce them into behaving properly at the table. This proper behavior includes, first of all, hearty eating and, in the case of children with good table behavior, includes such nonessentials as manners. Since it is easier to train children to eat sufficient food than it is to train them to be polite and mannerly, parents who try to coerce their children into eating in the socially approved style are forced to adopt more extreme measures than are parents who are content merely to have their children eat sufficient food. Insistence on good table behavior seems to indicate an attempt on the part of the parent to force the child to conform to adult standards; probably it also indicates a failure to realize that good table behavior is more than can be expected from the usual 5-year-old child.

It must be remembered that this pattern of home environment is not shown only at the table. In general, the home visitor arrives at her opinions about the home from a general observation, not merely from watching the child at meals. Therefore, it would appear that the parents' treatment of eating habits is symptomatic of a general parental attitude. Parents who insist on conformity to adult standards at the table probably also insist on conformity to adult standards in other areas. Conversely, parents who insist only that the child eat his food probably limit their demands in other areas to a few essentials.

If this analysis of the home environment is accurate, we should expect that children who show good table behavior would show the effects of the heightened pressure of parental coercion under which they live. The nursery school adjustment of all the children in the study was appraised by observations of the child in the Fels experimental nursery school.

From these records of nursery school behavior, it appears that the children with good appetite can be generally described as follows. They are conforming but are socially poised and popular. They are active and unafraid. They tend to be leaders. In summary, they are well adjusted to the nursery school environment and to children of their own age.

In contrast, the children who have good table behavior as well as good appetite are not well adjusted in nursery school. They are conforming but in a meek, cringing way. They tend to be socially isolated and shy. They are kind but not friendly to other children. They tend to inhibit their emotional expressiveness and to repress their emo-

tionality. Underneath this inhibition they have a turbulent emotional life. They are too conforming and too repressed to be well adjusted.

These differences between the group with good appetite and the group with good table behavior confirm our analysis of the home situation. Children who have good table behavior live under such a load of parental pressure and coercion that they cannot be free or outspoken in their general social relations. They are cowed to the point of being meek and cringing. They are so insecure that they cannot make the advances necessary for social adjustment. They are "kind" because kindness is one of the adult standards which their parents have stressed, but they are not "friendly" because friendliness demands a spontaneous sociability which these children cannot achieve.

On the other hand, it is not necessary to give children complete freedom in order to avoid this type of maladjustment. A coercive home which does not produce maladjustment can be exemplified by the children with good appetites. They thrive, psychologically speaking, on an environment which is coercive. What makes their environment so much more healthful than that of the children with good table behavior? It seems unlikely that it is merely the degree of coercion. A more likely hypothesis is that such a home is coercive only in regard to essentials. Good appetite, eating enough food, seems essential; good manners seem to be unnecessary embroidery. A home which hems the child in with a multitude of restrictions and coerces all of his behavior so constrains him that it renders him incapable of spontaneous free activity on his own responsibility. On the other hand, a few essential restrictions within which the child is allowed freedom seem to foster free expression of the child's wishes within limits he can handle. He is given security by knowing that he is restricted to a degree, that he does not have complete responsibility for his behavior. On the other hand, he is allowed opportunity to express himself and to be spontaneous. Therefore, he is better able to make a social adjustment than is the child who is too hemmed in by restriction.

It would be expected that he might also make a better adjustment than would a child unrestricted by any bounds, because he would have already come to the realization of his own limitations in controlling his environment and would be ready to accept the limitations which participation in a social group demands. Proof for this last thesis is not forthcoming in the present study.

All of this discussion has been based on the study of the children with good appetite and with good table behavior. The analysis of the group of nonfinical children is not so clear cut. It is clear that children who are not finical do not come from the same kind of homes as the children with good appetites. Coerciveness and restriction, even if only moderately severe and wisely administered, are not effective in making children nonfinical. On the contrary, an abundance of affection and

attention seems to be the most generally successful method of encouraging children to like a wide variety of foods. Since appetite and table behavior are measures of the child's behavior, while finicalness is a measure of emotional attitude, this finding is not unreasonable. It might be expected that coercive measures would be effective in influencing behavior but not so effective in influencing emotional attitudes. A child can be coerced into eating but he cannot be coerced into liking what he eats. Instead he must be persuaded, perhaps even cajoled, into liking foods which he may have initially disliked. Coercion seems likely to reinforce his dislike rather than overcoming it.

What is the effect of a pattern of affection and attention on the child's adjustment? As far as the data of this study are concerned, it has no consistent effect. Children who were high in finicalness did not, as a group, differ appreciably from the children who were low in finicalness in so far as their social adjustment was concerned.

SUMMARY

1. Unsatisfactory eating habits are the rule rather than the exception among an unselected group of children, but only 15 per cent of the group show sufficiently unsatisfactory behavior to be called "feeding problems."

2. Good appetite and good table behavior are closely related variables and are found in homes in which strict disciplinary methods are combined with approval of the child.

3. The type of strictness found in the homes of children with good appetites seems to be a strictness about a few essentials of behavior but not a strictness which completely determines the child's activities. This freer type of strictness seems to be psychologically healthful. The children from such homes tend to be socially well adjusted.

4. The strictness found in the homes of children with good table behavior seems to stem from an attempt of the parents to force the child into complete conformity to adult standards. This excessive constraint on the child's behavior seems to render him incapable of free and spontaneous behavior and to hamper his social adjustment.

5. A wide acceptance of foods and lack of finicalness is most generally obtained by an abundance of affection and attention. There is no evidence that a coercive discipline in the home can make children nonfinical.

THE PSYCHOLOGIC CARE OF CHILDREN WITH PULMONARY TUBERCULOSIS

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COMPLETE bed rest is the basic principle in the treatment of pulmonary tuberculosis. In order that this therapeutic approach be successful it is essential that methods be devised to make this treatment acceptable to the patient. Suitable entertainment must be provided. Adults have more resources for entertainment within themselves than do children. They can read, plan for the future, and play games, such as cards, checkers, and chess, which require a minimum of physical effort. They do not have the urge to run and play and are more content to be quiet than are children. Nevertheless, emotional upsets sometimes occur. Neglect of the child's mental and emotional needs may be directly responsible for an unsatisfactory therapeutic result.

Some children's hospitals have special wards for tuberculosis patients. Here trained workers are in daily attendance, playing games with the children and gradually teaching them to amuse themselves with minimum effort. Other hospitals and sanatoria with beds for children usually have a similar, if less elaborate, arrangement.

However, there are many children with active pulmonary tuberculosis who must be treated at home. Few of these can be made to realize the necessity of remaining in bed, although effort should be made to explain the situation to them. It is almost impossible to force a child to stay in bed, and even if it were possible, the resulting unhappy mental state would more than undo any benefit derived. It is the physician's duty to outline for the parents certain general principles for teaching the child to achieve both mental and physical relaxation. It is surprising how little initiative and imagination most parents have along this line.

An attempt must first be made to regulate the attitude of the parents. Many blame themselves for the child's illness, even though they are proved to be free of the disease. Unless this is corrected it may influence their feeling toward the child.[1] The parents should be urged to lead as normal lives as possible, but they should arrange to spend some time each day with the child.[2] They must be cautioned not to discuss the child's illness in his presence or to exhibit anxiety in any way. Failure to observe this rule may cause the child to become hypochondriacal or unduly apprehensive.

The sick child should have a daily schedule of rest, work, and play, but the schedule should be an elastic one. The child will desire an oc-

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casional variation in routine. Independence in the child should be encouraged by placing everything he may need within easy reach, but a bell should be placed conveniently near so that there will be no temptation to leave the bed. Parental overindulgence leads to the development of dependency and a demanding attitude on the part of the child.[2]

Every sick child should have a bed table. Unless contraindicated by his physical condition, he should be allowed to sit, well supported by pillows or a back rest, and play quietly at the table.

Children between the ages of 2 and 6 years present the greatest problem. For these, an occasional grab bag, consisting of a dozen 5- to 10-cent toys, may be used. One of these toys should be given the child every hour or two throughout the day.[3] Picture books, unpainted blocks, housekeeping toys, dolls, crayon color books, clay, simple wooden puzzles, and "matching" games are also helpful. All toys should be of the type which suggest playing quietly at the bed table and should be doled out one at a time to the child. Although frequent visits by either the nurse or mother may be necessary, it is best to allow the child to amuse himself as long as he is satisfied. It should be emphasized that nothing will prevent these children from having an occasional spell of restlessness and dissatisfaction, but skillful handling of the above-mentioned methods will reduce these to a minimum.

Older children are much more easily amused and may find pleasure in reading, drawing, crayon coloring, weaving, knitting, soap carving, and construction sets. Supervised visits by other children are helpful and should be arranged daily unless contraindicated by the communicable nature of the disease. It must be remembered that these older children, especially those approaching puberty, are the ones most prone to spells of deep mental depression. Such spells must be carefully guarded against and remedied as soon as they appear.

As soon as the acute stage of the disease is past, arrangements should be made for the school child to keep up with his school work. Regular daily assignments will help him realize that he is keeping up. Even graduation exercises should be held when indicated.

During the stage of rehabilitation, the convalescent child requires a stricter routine and more careful supervision than does the adult patient. The child should be made to understand as clearly as possible the reasons for such restrictions.

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American Academy of Pediatrics

Proceedings

MEETING OF THE EXECUTIVE BOARD

CHICAGO, ILL., JUNE 10 TO 11, 1944

A meeting of the Executive Board of the American Academy of Pediatrics was held at the Palmer House, Chicago, on June 10 and 11, 1944.

The first meeting was called to order at 10:05 A.M. by the President, Dr. Franklin P. Gengenbach.

The first order of business was the consideration of applicants. It was moved, seconded, and carried that the following applicants from Region I be elected:

Dr. Lawrence Charles Bachmann, Pittsburgh, Pa.
Dr. Daniel Blitz, Woodmere, Long Island, N. Y.
Dr. Joseph Caplan, Woodmere, Long Island, N. Y.
Dr. Caroline Augusta Chandler, Washington, D. C.
Dr. Harold S. Douglas, Brooklyn, N. Y.
Dr. Albert A. Frank, Malden, Mass.
Dr. Stanton Garfield, Concord, Mass.
Dr. Norman Louis Hawkins, Watertown, N. Y.
Dr. Joseph M. Klein, Wilkes-Barre, Pa.
Dr. Herman Frederick Kotzen, Reading, Pa.
Dr. Milton Kurzrok, Brooklyn, N. Y.
Dr. John D. Lyttle, New York, N. Y.
Dr. Donovan James McCune, New York, N. Y.
Dr. Frederick P. Rogers, West Hartford, Conn.
Dr. Harold S. Rubin, Hempstead, N. Y.
Dr. Sydney M. Saul, Pittsburgh, Pa.
Dr. Eli Scheer, North Bergen, N. J.
Dr. Maurice A. Shinefeld, Patterson, N. J.
Dr. Joseph Stein, Jamaica, N. Y.
Dr. Carl Albert Stettenbenz, Buffalo, N. Y.
Dr. Rudolph Ethelbert Vandeveer, Rome, N. Y.
Dr. Alfred J. Vignec, New York, N. Y.
Dr. Samuel Jacob Werlin, Troy, N. Y.
Dr. Fred R. Scheehter, Philadelphia, Pa.

It was moved, seconded, and carried that the following applicants from Region II be elected:

Dr. Jacob Travis Bennett, El Paso, Texas
Dr. William Andrew Daniel, Jr., Montgomery, Ala.
Dr. John Elbert Dunlap, Dallas, Texas
Dr. F. O. Calaway, Houston, Texas
Dr. Merl John Carson, Raleigh, N. C.
Dr. Gladys J. Fashena, Dallas, Texas
Dr. Thomas Bolling Gay, Atlanta, Ga.
Dr. Eva Linn Meloan, Jackson, Miss.
Dr. Walter Frank Qualtrough, Houston, Texas
Dr. Benjamin Sachs, Gretna, La.
Dr. Algernon Smith Hurt, Jr., Richmond, Va.
Dr. Jonathan Gay Van Dermark, Covington, Ky.

It was moved, seconded, and carried that the following applicants be elected from Region III:

Dr. Warren Francis Belknap, Detroit, Mich.
Dr. Charlotte Fisk, Des Moines, Ia.
Dr. Alexander N. Freed, Cleveland, Ohio
Dr. Harry Leichenger, Chicago, Ill.
Dr. Richard J. Lien, Rochester, Minn.
Dr. Henry Siegel, Detroit, Mich.
Dr. George E. Stafford, Salina, Kan.
Dr. John M. Thomas, Omaha, Neb.
Dr. Harry E. Waehter, St. Louis, Mo.
Dr. George H. Wegmann, Milwaukee, Wis.
Dr. Carl Witus, Detroit, Mich.

It was moved, seconded, and carried that the following applicants from Region IV be elected:

Dr. Jeanette Harrison, Los Angeles, Calif.
Dr. Elizabeth A. Murphy, Oakland, Calif.
Dr. Alice Potter, San Francisco, Calif.
Dr. Armin Rembe, Seattle, Wash.
Dr. Lawrence S. Siegel, Los Angeles, Calif.
Dr. Dorothy F. Wheeler, San Francisco, Calif.
Dr. Louise A. Yeazell, San Francisco, Calif.
Dr. W. R. Young, Salt Lake City, Utah
Dr. Morton Zall, Los Angeles, Calif.

The next order of business was request for Emeritus Fellowship. It was moved, seconded, and carried that Dr. Charles T. Williams, New Orleans, La., be elected to Emeritus Fellowship.

A request for Emeritus Fellowship was received from Dr. J. Gurney Taylor, Milwaukee, Wis. The Secretary was instructed to inform him

that according to the by-laws he is not qualified for Emeritus Fellowship, but the question of whether his retirement from practice will automatically make him eligible for Emeritus Fellowship will be considered by the Board.

Dr. H. H. Donnally of Washington, D. C., was granted Emeritus Fellowship.

It was moved, seconded, and carried that Dr. L. J. Halpern, Chicago, Ill., be reinstated.

It was moved, seconded, and carried that Frederick H. Allen, Philadelphia, Pa., be elected to Associate Membership.

The next order of business was the report of the Treasurer. Various items in the report were discussed. It was moved, seconded, and carried that the price of the pamphlets be raised to fifteen cents to cover additional mailing cost.

It was moved, seconded, and carried that the salary of Mrs. Bundy, stenographer to the Secretary-Treasurer, be raised to $175 per month, as of July 1.

It was moved, seconded, and carried that the Secretary be instructed to obtain suitable quarters for the business of the Academy.

It was moved, seconded, and carried that the new lease for the office of the Secretary-Treasurer be made out to the American Academy of Pediatrics and signed by the President and the Secretary.

It was moved, seconded, and carried that the budget with the changes made in it be approved.

Dr. Stanley Nichols reported for the Committee on Governmental and Medical Agencies.

The meeting adjourned for luncheon at 12:15 P.M.

The afternoon session was called to order at 2 P.M. by the President.

The first order of business was the report of the Committee on EMIC by Dr. Joseph Wall. The special items considered in this report were cash allotments, supplemental fees, rates of payment for health supervision, differential fees, and unusual or prolonged illness.

It was moved, seconded, and carried that the report of the Committee on EMIC program be accepted with a preamble dealing with the relationship between the Academy and the Children's Bureau as expressed in the discussion of the Board.

[The statement of the Executive Board and report of EMIC Committee follow the minutes of the meeting.]

It was moved, seconded, and carried that the American Medical Association be asked to appoint a committee on child health to cooperate with the American Academy of Pediatrics.

It was moved, seconded, and carried that the Executive Board request the Children's Bureau to withdraw from circulation and suppress Folder No. 31. If reissued, (1) eliminate reference to the quality of care in the clinic as being superior to that given by a doctor in his office and (2) eliminate the repeated dictum that the clinics should be free to all comers, irrespective of financial status. The Board would recommend that the infants of servicemen be admitted to clinics during the war emergency irrespective of the financial status of the parents.

The next order of business was the report of the Regions.

Dr. Stringfield reported for Region I. It was moved, seconded, and carried that the report be accepted.

Dr. Moore reported for Region II. He stated that a regional meeting was held jointly with the Southern Medical Association in November, at which time the question of redistricting the United States into three regions was discussed. It was voted to postpone consideration until after the war. It was moved, seconded, and carried that the report be accepted.

Dr. Berkley reported for Region IV. This region has held no meeting and there are no plans for future meetings. It was moved, seconded, and carried that the report be accepted.

There was no report from Region III.

Region V was discussed. It was moved, seconded, and carried that Dr. Albert Peguero be elected to membership.

It was moved, seconded, and carried that the traveling expenses of Dr. Gomez of Mexico and Dr. Hurtado of Cuba from and to St. Louis be paid.

The question of notifying the Cultural Relations Department about appointment and date of arrival of scholars was discussed. No action was taken.

Insurance for scholars was discussed. It was moved, seconded, and carried that the Secretary be given power to act on this proposition provided he does not spend more than one dollar per year per scholar.

It was moved, seconded, and carried that certificates for scholars be provided.

The Secretary reported that there are now fourteen scholars.

There was discussion on the Spanish translations of articles and the cost.

The meeting adjourned at 6 P.M. to reconvene at 8 P.M.

The evening meeting was called to order at 8 P.M. by the President.

The first order of business was Committee reports. The Secretary read a report from Dr. Albert Kaiser, Chairman of the Committee on Cooperation with Nonmedical Groups. It was moved, seconded, and carried that the report be accepted.

The Secretary read the report from Dr. Carl H. Smith, Chairman of the Committee on National Defense. It was moved, seconded, and carried that the report be accepted.

The next order of business was the report of the Committee appointed to draft the preamble to be attached to the report of the EMIC Committee. It was moved, seconded, and carried that the preamble should be attached to the report as a statement of policy.

It was moved, seconded, and carried that when this report of the EMIC Committee is printed, 1000 reprints be made for distribution.

The next order of business was the report of the Committee on Pan-American Scholarships, Dr. H. F. Helmholz, Chairman. It was moved, seconded, and carried that the report be accepted.

The Secretary read the report of the Committee on Geographical Distribution of Pediatricians, Dr. O. L. Goehle, Chairman. It was moved, seconded, and carried that the report be received.

The Secretary read the report of the Committee on Rheumatic Fever, Dr. Alexander T. Martin, Chairman. It was moved, seconded, and carried that the report be accepted.

The Secretary read a letter from Dr. H. M. Marvin inviting the Academy to participate in the formation and work of a Council on Rheumatic Fever. It was moved, seconded, and carried that the Secretary be instructed to write Dr. Marvin telling him that the Academy will be glad to participate and to send a contribution of $100.

The Secretary read the report of the Committee on School Health, Dr. Harold H. Mitchell, Chairman. It was moved, seconded, and carried that the report be accepted.

The Secretary read a letter from the American Board of Pediatrics concerning representation on the Board. It was moved, seconded, and carried that this matter be left in the hands of the President for discussion with Dr. Aldrich.

The Secretary reported on the plans for the annual meeting.

It was moved, seconded, and carried that a five dollar registration fee be charged.

Dr. Martmer read the footnote to follow after Section I of the report of the EMIC Committee. This read as follows:

> It is the consensus of the Executive Board that the cash allotment method of disbursing these funds would be preferable since it would tend to preserve the patient-physician relationship. The Board emphasizes that it is in view of the exigencies of war that the action of the Committee is approved.

It was moved, seconded, and carried that this be approved.

The meeting adjourned at 10 P.M. to reconvene on Sunday at 9 A.M.

The meeting was called to order on Sunday, June 11, at 9 A.M. by the President.

It was moved, seconded, and carried that Marshall Pease be appointed historian.

The Secretary read a letter from Dr. Quillian now on duty in the South Pacific.

It was moved, seconded, and carried that the suspension of dues of men in Service be continued for one year, dated from January 1 and July 1, following their discharge from Service.

There was discussion on redistricting the entire Academy because of the size of Regions I and III. It was suggested that this matter be brought up for discussion at the State Chairmen's meeting in November.

The question of having Mr. Selz direct the publicity for the Annual Meeting was discussed. It was moved, seconded, and carried that the Secretary be empowered to engage Mr. Selz for the handling of publicity at the Annual Meeting for the sum of $600 plus expenses.

The Secretary presented a proposal from The Borden Company to grant a $1,000 prize for the best work in nutrition each year to be determined by the Awards Committee of the Academy. It was moved, seconded, and carried that it be accepted.

The Secretary read a letter from I. A. Quackenboss asking that the Academy approve a film to be gotten out by Johnson and Johnson entitled, "The Bathing Technic." It was moved, seconded, and carried that the President appoint a special committee to investigate the Johnson and Johnson film.

The Secretary read a letter from Dr. Arnold Gesell regarding "Extern Fellowships in Developmental Pediatrics and Possible Arrangements at the Yale Clinic of Child Development." It was moved, seconded, and carried that the Secretary write Dr. Gesell to the effect that the Executive Board is heartily in sympathy with the plan but that it does not have funds available for promoting it, and, secondly, that the Board feels that the qualifications for attendance at such clinics are too low.

The Secretary read a letter from Dr. Warren M. Cox, Jr., of the Mead Johnson & Company asking permission to reproduce the charts in "Child Health Record from Infancy to Adulthood." It was moved, seconded, and carried that the report be granted.

The Secretary-Treasurer asked permission to invest from $2,000 to $4,000 of the Academy funds in Government bonds in the present bond drive. It was moved, seconded, and carried that the permission be granted.

The Secretary stated that he was going to Panama in August to give a series of talks. He could spend a week at Havana on some of the Academy problems. It was moved, seconded, and carried that the expenses of the Secretary during his stay in Havana be paid by the Academy.

Dr. Wall reported on his trip to Mexico. It was moved, seconded, and carried that the report be accepted with the thanks of the Executive Committee and published in the JOURNAL.

Dr. Martmer read some correspondence from Sharp & Dohme, Inc., concerning a film on Immunization. It was decided that this film could be shown at the annual meeting by special announcement but not put on the regular program.

It was moved, seconded, and carried that the report of the Committee on Governmental and Medical Agencies be received.

The President thanked all the members of the Executive Committee and the members of the EMIC special committee for their valued services and for coming to the meeting.

There being no further business the meeting adjourned at 11:10 A.M.

THE EMIC PROGRAM

The Executive Board of the American Academy of Pediatrics in session June 10, 1944, at Chicago is unanimously of the opinion that the time has arrived when serious consideration must be given to the relationships existing between the Academy and the Pediatricians of the United States on the one hand and the Children's Bureau of the Department of Labor on the other.

In the Act creating the Children's Bureau its purposes were stated as follows:

> The said Bureau shall investigate and report to the said Department upon all matters pertaining to the welfare of children and child life among all classes of our people, and shall investigate the question of infant mortality, the birth rate, the orphanage, juvenile courts, desertion, dangerous occupations, accidents, and diseases of children, employment, legislation affecting children in the several states and territories; that the Chief of said Bureau may from time to time publish the results of these investigations in such manner and to such extent as may be prescribed by the Secretary of Labor.

Gradually the scope of the Bureau's activities has wandered rather far afield from these purposes, as exemplified, for example, by the EMIC program. In Congress, in fact, the question has come up as to the extent given it under this authority to engage in promotion or desirable extension work that may follow the results of its investigations and studies, and as to whether or not its functions should not cease at that point.

The Children's Bureau did excellent work in health education, in fostering the development of State Divisions of Maternal and Child Health and in promulgating health programs for mothers and children. In a definite way it took over the work and function of the American Child Health Association, a voluntary organization which had been in large part developed by pediatricians who furnished its leadership over a long period of years.

From its inception the Children's Bureau has had the backing and support of the pediatricians and their scientific societies, such as the American Academy of Pediatrics. Not so many years ago it was proposed to transfer the health work and services of the Children's Bureau to the United States Public Health Services. While from a broad viewpoint this was a logical and sound proposition, backed by nearly all medical organizations, the pediatricians after much discussion exerted their influence to have these functions continued under the Children's Bureau on the basis of its accomplishments and the excellent work it was doing in the field of child health and welfare.

Shortly after the entry of the United States into the present war, with thousands of physicians entering military service, a critical health situation developed in certain defense areas and in the vicinity of some army camps. The question was essentially one of personnel and facilities. The

Academy called attention to this situation and its dangers as early as 1941, and later more emphatically urged that some solution be found.

In order to meet a limited restricted problem in the State of Washington the Children's Bureau made certain current social security funds available to pay for maternity and infant care in this area. Rapidly the Children's Bureau expanded this program throughout the United States. The purpose of the original expediture of funds to meet emergency needs in a limited area now was changed to provide obstetrical and medical care for the wives and infants of all enlisted men of certain ranks on the basis of removing worry from the men in service. On these grounds increasing sums of money have been appropriated by Congress as an emergency war measure to be expended by the States under general regulations established by the Children's Bureau. In the development of this program the physicians of the country were given no voice in the formation of plans and policies, although the carrying out of the program was of necessity dependent upon their efforts and cooperation. In other words the function and purposes of the Children's Bureau have been abruptly changed so that it is now an active factor in the practice of medicine throughout the United States, dictatorily regulating fees and conditions of practice on a federal basis. While it was the definite intent of Congress that the funds appropriated were to be expended by the individual states to meet conditions existing within their borders—and the problems differ state by state—and that federal control should be minimum, there is ample evidence that programs proposed by some states to meet their local needs have not been approved by the Children's Bureau. In this way control has been maintained on a federal basis contrary to the intent of Congress. By no stretch of imagination can the Children's Bureau be considered as a proper or suitable agency to take part in or control the practice of medicine.

As the EMIC program has unfolded much criticism has developed, some justified and some, due to misunderstandings, unjustified. The Children's Bureau is in large measure responsible for this as it failed from the beginning to make its plans and purposes clear to the physicians. The attitude of distrust toward the physicians and hospitals of the United States, as shown by the Bureau's statements and regulations has played no small part in the attitude of physicians toward the EMIC program, despite the fact that the contribution of physicians to the war is acknowledged by everyone.

In November, 1943, the EMIC program came up for discussion at the meeting of the Executive Board of the American Academy of Pediatrics, and before taking action on the many complaints and criticisms of its members, the Academy passed the following resolution.

Whereas, The Executive Board of the American Academy of Pediatrics meeting in full executive session at the Palmer House in Chicago on November 6, 1943, is in complete sympathy with the objective that wives and infants of the servicemen

should receive the best quality of obstetric and pediatric care during the present emergency, and

Whereas, The Children's Bureau has inaugurated plans and regulations to carry out the intent of Congress to provide a high type of medical care for the wives and children of our men in the Armed Services, and

Whereas, The present administrative regulations as set up by the Children's Bureau have, in the application of the program, revealed certain weaknesses which seriously interfere with securing such high type of medical care for wives and infants of servicemen,

Be It Resolved, That in order to attain the high quality of medical service to which the wives and children of servicemen are entitled, it is the sense of this Board that the Children's Bureau should call, forthwith, a conference of official representatives of the servicemen, together with official representatives of the professions actually rendering this service; namely, the American Medical Association, the American Hospital Association, the U. S. Public Health Service, and the American Association of Obstetricians and Gynecologists, and the American Academy of Pediatrics. The purpose of the initial and future conferences to be the solution of the common problems which have arisen and will continue to arise until a method based on American democratic principles shall be established and utilized, and

Further Be It Resolved, That copies of this resolution shall be sent to the central offices of the above-named and other interested organizations.

The Children's Bureau called a conference as requested, but invited in a large group of individuals representing lay organizations, such as the W. C. T. U., the Y. W. C. A., the National Women's Trade Union League, etc., who in no possible way were involved in the carrying out of the program, but who were of importance to the Children's Bureau from a propaganda standpoint. This meeting in the opinion of the Executive Board was utterly useless and the mass of nonmedical representatives invited by the Children's Bureau to a medical conference defeated the purpose of the meeting requested by the Academy.

The Academy and the physicians of America have demonstrated in many ways their willingness to give full support to any measure that will help win the war. It cannot approve, however, of measures established by a government bureau which under the guise of war effort or necessity arbitrarily control medical practice, and which are in reality plans for the control of postwar medical practice. Nor can the Academy approve of the Children's Bureau, under the cloak of war effort, extending its functions far beyond its established purposes to initiate the framework of a general plan of health and medical care for the children of the United States.

Every evidence of such intention is gradually appearing. Statements in print (*Parents' Magazine,* January, 1944), the recent *Bulletin on Child Health Conferences* containing not only misleading but false statements, all show the definite picture of the thought and intention of those at present in control of the Children's Bureau.

The pediatricians of America have been and are among the most progressive group of physicians in the United States. They have pioneered in preventive medicine and in this field have accomplished more than any

other group. They realize that many changes in the practice of medicine are necessary and are willing and glad to discuss and participate in progressive movements. They realize as any intelligent person must that no method of practice or change in practice can be successful without the cooperation of the physicians of America, for on them rather than on an administrative bureau lies the task of furnishing medical care.

Because of the way in which the Children's Bureau has tended to turn away from the purpose for which it was founded, its entrance into active participation in medical practice, and the obvious intent to create for itself a role in pediatric practice in the future, we feel the time has come when the Academy and the pediatricians of the United States must withdraw their support from the Children's Bureau, and use their influence as a group and as individuals to place all health activities under the Public Health Service as is now again being proposed in Congress, and, further, to work for the development of a Secretary and Department of Health in our federal government, under which all health activities now distributed through many conflicting and competing agencies would be combined.

Realizing that we are a nation at war and in justice to the men in service the pediatricians are eager and willing to cooperate to the fullest extent with the EMIC program with whose purpose they are in sympathy, although they feel that the present program is poorly conceived and badly administered.

The Executive Board of the American Academy of Pediatrics feels that certain changes in the administrative regulations will do much to make the program more effective. It, therefore, approves the following statements and recommendations regarding certain controversial matters together with suggested changes in the regulations of the Children's Bureau submitted to it by the Special Academy Committee on EMIC.

REPORT OF THE SPECIAL COMMITTEE ON THE EMIC PROGRAM TO THE EXECUTIVE BOARD OF THE AMERICAN ACADEMY OF PEDIATRICS

To the Executive Board:

The special committee met at 10:00 A.M. on June 9, 1944, the following being present:

The President, Dr. Gengenbach, and Drs. Lee Hill, Veeder, Hess, Butler, Linde, Chenoweth, Eliot, Nichols, and Wall. Unavoidably absent: E. B. Shaw.

The Chairman read a letter under date of February 28, 1944, from the Secretary-Treasurer authorizing the appointment of the committee by the President and naming the members.

A tentative agendum was presented dividing the discussion by the committee into two parts: (1) objections to the EMIC program from various sources, and, (2) proposed changes in the program to effect more harmonious cooperation by those concerned.

The Chairman read an outline of matters concerning the operation of the EMIC program which had heretofore concerned the Academy through its Executive Board and its Committee on Legislation and which, up to this date, had been considered by these groups in the absence of any meeting of the Academy as a body in annual session:

1943—

April 6. Several Fellows of the Academy, members of the Advisory Committee of the MCH of the Children's Bureau met in conference at the Bureau.

October. A second meeting of the same group.

November 6. The Executive Board approved a resolution asking for a conference with the Children's Bureau and with certain interested bodies, namely, the American Medical Association, the American Hospital Association, the U. S. Public Health Service, the Association of Obstetricians and Gynecologists, the American Academy of Pediatrics, and representatives of the servicemen.

November 16. Conference at Cincinnati with Dr. Eliot and several State chairmen together with some members of the Academy attending the Region II meeting, then in session.

November 29. Chairman of the Committee on Legislation conferred with Drs. Eliot and Dailey at the Children's Bureau and offered suggestions.

November 30. Letter to Dr. Eliot from Chairman of the Committee on Legislation.

December 10 and 11. Children's Bureau conference as requested by the Executive Board.

December 23. Letter to Dr. Eliot from Chairman of Committee on Legislation.

1944—

February 1 and 2. Children's Bureau conference of pediatricians, health officers and MCH directors, with especial reference to "health supervision."

May 26. New York City conference of Region I State Chairmen. There were present Doctors Eliot, Linde, Nichols, and Wall of the EMIC Committee.

The special EMIC Committee then entered into general discussion in the course of which were considered the following specific subjects:

Cash Allotments—referred to a subcommittee of Doctors Veeder, Hill and Nichols.

Supplemental Fees and Separation of Medical and Hospital Care—referred to a subcommittee of Doctors Hill, Veeder and Nichols.

Differential Fees, Health Supervision, Sick Infant Care—referred to a subcommittee of Doctors Eliot, Hill and Linde.

The special committee then considered at length the replies to the questionnaire sent to the Regional and State Chairmen; the qualifications of those taking part in health conference work and the subject of State health agencies working out a plan to bring into the picture pediatric hospitals, and pediatric centers, there being not enough positive action of this sort.

On motion of Dr. Hill it was recommended that the Executive Board recommend to the Academy that it urge that the health agencies of the various states, pediatric centers and hospitals work out a plan to further extend the participation of the group in the operation of the EMIC program.

At the evening session, the reports of the subcommittees were received and discussed and the following recommendations were adopted for presentation to the Executive Board on June 10 and 11.

PAYMENT OF EMIC FUNDS

The question of payment under the EMIC program, whether a cash grant to the wife of the serviceman, or payment direct to the hospital and to the physician on a service basis, as at present, has been considered at length by the committee. Many resolutions have been passed by medical groups recommending a change and a poll of Academy State and Regional Chairmen was in favor of such a change in the ratio of 2 to 1.

The committee finds that direct payment to the physician was not an arbitrary ruling by the Children's Bureau, but was the intent of Congress when it passed the first EMIC appropriation, and this position has since been maintained despite opposition to this viewpoint presented at subsequent congressional committee hearings. A change could only be made by an Act of Congress.

It is of further importance to note that most of the medical prepayment plans being considered, or at present sponsored, by State Medical Societies call for a direct payment to the physician and not to the patient. In some instances experience has led to a change in the original plan of payment to the patient to one of payment to the physician.

As an alternative it has been proposed that payment be made by the Government direct to the wife through the "allotment office" which handles voluntary and dependency service allotments. Those familiar with the volume of work of this office and its methods and regulations, some 7,500,000 checks are mailed monthly and 20,000 changes in allotments are made daily, realize that allotment made by this agency direct to wives would necessarily lead to a decided increase in red tape and paper work, to which so many objections have been made in the present method, with the result that much more of the physician's time would be occupied and that an elapse of months might ensue before the wife received the money to pay the hospital and the physician. This would lead to many difficulties in the physician-patient relationship and in all probability would end in many instances in the failure of the physician to be paid for his services.

Another possibility that suggests itself is that Congress pass legislation directing that payments be made direct to the wives by a State agency rather than the Federal Allotment Agency, in the same way that certain other social security funds are distributed.

The EMIC committee has reached the conclusion that although much is to be said for an allotment payment to the wife, who in turn pays the hospital and physician, from a practical standpoint the direct payment to the physician and hospital is the most feasible under an emergency war program.

The Committee makes it emphatic that these conclusions and recommendations are based solely upon the exigencies of war.

SUPPLEMENTAL FEES

Of the replies received from Regional and State Chairmen, on the question of supplemental fees, three-fourths felt that the present administrative ruling which prohibits them is incorrect. It was the consensus of the Committee that this problem is one that mainly affects the obstetrician since over 90 per cent of the present medical payments are made for obstetrical services. Closely related to this problem is that of divorcing hospital and physicians' fees for medical service, since the payment of the physician by the patient and the payment of the hospital from EMIC funds is, in reality, a method of supplemental payment.

The Committee fully realizes the present fees allowed for pediatric services fall far short of those customarily prevailing for this type of specialized service. It considered at length the administrative and other difficulties involved were supplemental fees to be permitted. Also considered was the intent of Congress and military personnel that service-

men be entirely relieved of any anxiety relative to obstetrical and pediatric care necessary for their wives and children. In view of these considerations, the committee is of the opinion that pediatricians will willingly and patriotically contribute the differential between usual pediatric fees and those allowed under the EMIC program.

The Committee makes it emphatic that these conclusions and recommendations are based solely up the exigencies of war.

RATES OF PAYMENT FOR HEALTH SUPERVISION

For health supervision, including immunizations and minor illnesses, sought in behalf of and received by an infant in the offices of doctors of medicine whose qualifications are accepted by the State health agency and are in accordance with the general policies defined by the Children's Bureau, at rates not to exceed $20.00 per annum, with a differential of 50 per cent increase for physicians qualified as pediatricians by the technical advisory committee of the State health agency. If fewer than eight office visits for health supervision are made during the year, or if immunizations are not completed during this period, the amount of payment will be made on an equitable pro rata basis established by the State health agency.

The Committee makes it emphatic that these conclusions and recommendations are based solely upon the exigencies of war.

DIFFERENTIAL FEES

The poll of the Academy Regional and State Chairmen showed that only three were satisfied with the fee schedule for pediatricians while 27 (90 per cent) were not satisfied. Twenty-eight (80 per cent) felt that there should be a differential in the fee paid the pediatrician and the general practitioner for the same services. Twenty per cent thought there should be no differential in fees.

It is the opinion of the Committee that due to extended training and better preparation, qualified pediatricians rendering services for the care of infants under the EMIC program be remunerated with fees 50 per cent greater than those usually paid to physicians under this program. It is further suggested that standards of qualification and lists of physicians qualified as pediatricians be recommended in each State by a technical advisory committee of the State health agency composed of physicians, such committee to include official representatives of the State Medical Society.

The Committee makes it emphatic that these conclusions and recommendations are based solely upon the exigencies of war.

UNUSUAL OR PROLONGED ILLNESS

It is recommended that under circumstances where illness is exceptionally prolonged or severe and requires an unusual amount of medical services, special consideration be given by the technical advisory com-

mittee of the State health agency to a modification of the regular fees in the EMIC schedule in order to effect an increase in such fees to properly compensate the physician for the additional burden of medical care in such instances.

The Committee would recommend that the above named policies be presented to the Followship of the Academy as representing the considered judgment of the special EMIC committee and the Executive Board after repeated conferences among officers and committee representatives of the Academy, together with members of the Children's Bureau who administer the EMIC program.

Respectfully submitted,

JOSEPH S. WALL, Chairman
Special EMIC Committee

ACTION OF THE EXECUTIVE BOARD

The Executive Board at its meeting June 10 and 11, adopted the report of the special EMIC Committee with the following proviso to take the form of a footnote to be inserted at the end of the report. To wit:

FOOTNOTE

"It is the consensus of the Executive Board that the cash allotment method of disbursing these funds would be preferable since it would tend to preserve the patient-physician relationship.

"The Board emphasizes that it is in view of the exigencies of war that the report of the committee is approved.

"The Executive Board directs the special committee on the EMIC program to include in its studies the question of the facilities available for health supervision of infants and for promoting the welfare of children."

Editorial

THE ACADEMY AND THE CHILDREN'S BUREAU

The action taken by the Executive Board of the Academy in session in Chicago, June 10, in regard to the Children's Bureau, which appears on page 88 of this issue of the JOURNAL, was not a hasty impetuous action but a considered action that became inevitable as the picture of the EMIC program gradually unfolded and the underlying intent of the Children's Bureau has become clear. Over a period of many months the Academy has attempted to cooperate in every way, through discussion, through special committees representing the Academy, and through group conferences as well as individual conferences between members of the Academy and members of the staff of the Children's Bureau.

The intent and desire of the Academy to cooperate as a war emergency is well shown by the action of the Board approving the recommendations of the special EMIC committee (page 92), although the recommendations were not in keeping in some matters with the desire of the Academy membership as expressed in replies to a questionnaire recently sent to the State chairmen. The Board realized that the members of the committee who had been concerned with the program over many months had a more intimate picture of the problem centering around the specific details of the program as it is being administered by the Children's Bureau.

Of much greater importance in the mind of the Board is the underlying thought and philosophy of those at present administering the Children's Bureau, and the obvious intent of the Bureau under the guise of a war emergency to secure for itself a permanent postwar place in medical practice in the United States. It was for this reason that the Board, speaking for the pediatricians, expressed its thought in what might be termed a preamble in accepting the recommendations of the special EMIC committee. While the Board, representing the Academy, is desirous of wholeheartedly cooperating with the Bureau in the EMIC program as a war emergency and to do everything possible in furthering and hastening the winning of the war, it is unwilling to accept war emergency methods as the basis of a plan for the future practice of medicine and pediatrics in the United States.

Its action cannot be construed, as in all probability the attempt will be made to have it construed, by propagandists of the Children's Bureau as unpatriotic and a failure to back up the men who are in service. Let it emphatically and plainly be restated that the Academy and the pediatricians will continue wholeheartedly to support any act of Congress as a war measure and to do everything possible for the men in the serv-

ice, but they firmly intend to definitely distinguish between war emergency measures and a plan to insidiously carry over emergency measures as the basis of a permanent plan of medical practice. It has again and again been emphasized in Congress that the EMIC plan is an emergency plan and support was given to it on this basis. Now, however, based on printed statements of members of the staff of the Children's Bureau, personal discussions with members of the Academy, together with literature recently issued by the Children's Bureau, it has become clear that the intent of the Bureau is to enter on the practice of medicine when the war is over and to continue the EMIC program under some other guise. It is to this that the Academy objects and which it opposes.

The intent of the Bureau is shown by numerous incidents. Striking among these is the way the question asked in one way or another by Academy representatives in individual conversations and at official conferences called by the Children's Bureau as to whether or not the program was strictly an emergency one, or one that in some form would be carried over into postwar practice. In official conferences the answer was always evaded so that no such statement would appear on the records. In nonofficial conferences the idea of developing a postwar program developed from the present EMIC program has been suggested. In the January, 1944, number of *Parents' Magazine* (p. 61) Dr. Martha Eliot, Assistant Chief of the Children's Bureau, wrote as follows—"The start of this (EMIC) program marks a red-letter day for the United States for it is truly a program of *public* maternity care. It is a small *beginning* to be sure, but its significance is great. It marks a *major break* from our present *makeshift* system . . . why shouldn't we as citizens dream a dream of *public maternity care* for expectant mothers and their babies." (Italics by writer).

"We are already paying the bill for a considerable portion of this out of our individual pockets. If, instead, we were to divide up the total cost among us in the form of general taxes collected by the state and federal government annually, it would probably not amount to more than an average of $2.00 to $2.50 per taxpayer" (p. 62). "Plans for paying doctors and nurses will have to be worked out. Ideally full-time salaried physicians in each hospital would be best" (p. 63). In other words, a free to all service with full-time salaried physicians, paid for directly from general taxes and controlled and directed by a federal bureau is the plan of the Children's Bureau.

In Folder No. 31, recently issued by the Children's Bureau, the plan of the Children's Bureau for pediatrics at last becomes clear. It urges the development of well-baby clinics in every community and states that it is the job of a local committee, which it urges should be set up and to which it states social security funds are available through the Children's Bureau. "To insist that clinics be open to all mothers who seek this service free of charge." It states that the EMIC program will

rely on child health conferences for child health supervision for the infants of men in the armed forces to whom the EMIC program applies. In other words, the Children's Bureau urges the development of child health conferences paid for through federal funds as a part of the EMIC program and at the same time insists the conferences shall be open to all infants regardless of whether or not they belong to the EMIC program. This is quite beyond the intent of Congress in financing the program, and shows definitely the intent and purpose of the Children's Bureau.

The statement is made that "The service that the mother receives in a child-health conference is more than she can get in the usual visit to a doctor, for in the clinic she has the combined help of a group—physician, dentist, nurse, nutritionist, and others—working together to advise about her children's care." A rosy picture, but it is safe to say not one child-health conference in a hundred is organized on this basis.

The well-baby clinic is not a development of the Children's Bureau. It was developed by pediatricians to meet certain specific needs long before the Children's Bureau came into existence. Its purpose was to furnish medical health advice to mothers of the low income group who were unable to pay for such help, and it was developed at a time when the number of physicians who were trained to give such help was relatively few.

The place of well-baby clinics in the field of medical practice and child health was given serious consideration by pediatricians some fifteen to twenty years ago, and it became clear that the logical development of child-health lay in the education of physicians in the medical schools and the development of pediatrics as a specialty. Working along these lines a definite campaign was developed by the pediatricians to have pediatrics made a major clinical subject in our medical schools and to establish high standards for pediatric education and practice. The success of this program is well known. In the space of fifteen years the number of pediatric specialists has grown from a few hundred to nearly three thousand. Several hundred more younger physicians who have just finished their specialized training have gone into service with the armed forces. Even more important the thousands of young physicians who have graduated from our medical schools in recent years have had more training in infant and child welfare than the specialist of twenty-five years ago.

In an article written some twelve years ago on "Child Welfare" for Brennemann's Practice of Pediatrics (Vol. 1, Chap. 7), Veeder, who had been active over a period of nearly twenty years in developing and administering Well-Baby Conferences in St. Louis, in a discussion of methods wrote as follows:

> An exact appraisal of the value of the work of the "health center" is difficult or even impossible to make. It is but one of the influences leading to the lowering

of the infant mortality and morbidity rate which has taken place in recent years. The lowering of this rate, however, has been largely in the socioeconomic level which the centers serve. Many other interrelated factors have played a part, such as better sanitation in the cities, improvement and pasteurization of the milk supply, health education in the schools and by the radio, food inspection, and the like.

There are a number of defects or handicaps inherent in the "health center" method of infant care which definitely limit its usefulness and make it far from an "ideal" method, while at the same time it remains as the best available practical method for reaching certain groups of infants who otherwise would have no supervision. It has thus made for itself a definite place in the picture of medical institutions. Unfortunately the chief criticism of physicians has been directed along economic lines rather than along lines of medical efficiency. It falls more within the scope of this discussion to consider these medical defects and weaknesses. The vast majority of infants are not registered at the center until well after the first month of life. Thus no supervision is afforded in the period when over one-half of the infant mortality takes place. This has led to the development of the prenatal clinic in association with the infant health center and to social service cooperation between the maternity service in the hospitals and the centers. This liaison is far from being in common use, but, where it has been developed, the average age of infants at time of registration has been considerably lowered. It is still exceptional, however, to find infants registered at the center under the age of 6 weeks to 2 months and thus supervision starts at a time when the highest period of infant mortality is over.

The chief defect of the infant welfare center lies in regarding an infant when well as one individual and the same infant when sick as another. Not only from a practical point of view but for psychologic reasons the "center" has found it necessary to focus on the health of the infant and to confine its efforts to "well" baby and preventive measures. Otherwise it becomes a dispensary for sick infants. There is no difference of opinion in regard to this viewpoint. Health and sickness are so closely related and so interdependent that such a separation in itself defeats adequate medical supervision of the infant. A paradoxic situation is thus created from a practical necessity. It must be frankly admitted and recognized, therefore, that the well-baby clinic does not and cannot offer a complete or ideal medical supervision of the development of the infant.

A third defect in the clinic lies in the constantly changing character of the clinic personnel. The frequent changes in physicians and nursing staff lead to a loss of individualization of the infant and his development becomes more of a "record knowledge" rather than a knowledge of the infant as an individual. No practical method of record keeping has as yet been devised to record the development of an individual.

There are certain inherent defects in the well-baby center, or infant welfare clinic, which limit its usefulness in a practical way, and in theory remove it far from a method of ideal medical supervision for the developing infant and child. We believe that our efforts should be directed more in other directions and that because of its inherent defects the health center should be looked upon only as a practical method of reaching certain infants and children who would not otherwise receive supervision, and that its extension should be developed with only this definite view in mind.

We must bear in mind that this analysis was not written as a part of any controversy or propaganda, but was a judicial statement by a pediatrician who had been engaged in child health work for many years. Its importance in the present discussion lies in the misleading statements in the circular recently issued by the Children's Bureau which

by the uninformed lay individual will be interpreted that the well-baby conference is the ideal method of giving health supervision to the infant.

The Board realizes that it has certain definite responsibilities to the men in service. It has the responsibility of aiding in every way any war program proposed by those entrusted with the conduct of the war. It does not hold, however, that this means it must remain silent when a program outlined for the civilian population is under discussion which it feels does not meet the problems and is administered in a way that has aroused deserved criticism and even the antagonism of many upon whose success the carrying out of the program depends. To the child of the man in service it owes the best medical care that it is possible to give under wartime conditions. As it considers that the EMIC plan is not the best method of obtaining this and further that the EMIC program does not meet the needs that have developed as a result of the war, it feels it has the duty to constructively criticize the present plan and its administration.

It further has a responsibility to the hundreds of pediatricians in service who have willingly given up their practices, many at a great personal sacrifice, to become a part of the fighting forces for duration. To these men it has the responsibility to see that a "war emergency measure" shall not be carried over into a permanent institution, so that when they return they will not find the practice of pediatrics on a free basis administered by the Children's Bureau under financial conditions and regulations arbitrarily imposed by a federal bureau. For the younger pediatricians who have just finished their long period of specialized training and entered military service there must be more than a federal job waiting.

To the children of America, upon whom the future of America depends, the Academy has a duty. There must be no stabilization of pediatric development, which the Board feels would take place if the plans and intent of the Children's Bureau should prevail. All of the medical aspects and development of infant and child welfare in the past have been the result of the development of pediatrics. What the Children's Bureau proposes is a method of using and limiting this pediatric knowledge in such a way that it would in large part put an end to future progress.

The Academy and the pediatricians of the United States are not reactionary. They have admittedly been the most progressive physicians in America, both as a group and as individuals. In fact they have been severely criticized in the past for their progressive attitude by many of their medical colleagues in other fields. They have taken part and will continue to take part in progressive movements that involve better care for every child. They have realized in the past and know today that changes in the economics of medical practice must be made to better equalize the cost of medical care in order that adequate care may be

available to everyone. They know, however, that separating the care of the child when well from the care of the same child when sick is not the best care and is only justified under the present economic system of medical practice. They are also fully aware that a federal paid and controlled plan offering free medical care to everyone is not the answer to the problem of medical distribution and practice, and further that such a plan or method would eventually lead to a deterioration in medical care rather than an improvement.

In any plan two things are clear, first that no program for medical care or distribution can be a success from the standpoint of the character and quality of care unless it has the support of the physicians upon whom the care of the patient must fall. Secondly, no plan can be successful or of value which does not include the entire content of medical practice. To have public health under one departmental administrative bureau, the care of the mother and child under another, while the socio-economic administration of all other fields of medicine falls under a third is an absurd situation to everyone, except perhaps to the minds and purposes of a departmental bureaucracy intent on gaining and holding power for itself.

The time has come when the only logical and sound procedure is to place all medical and health activities in which our government participates— and today this includes medical education—in one department, which will have in one way or another representatives of the medical profession who can speak for the physicians upon whom the character and quality of medical care ultimately depends. Only in this way can present conditions be intelligently modified and future plans for medical care evolved which will maintain all that has been accomplished in the past and lead to better medical care for everyone in the future.

This brief statement, which of necessity omits many details, presents the basis and background of the action taken by the Academy Board.

The Pediatrician and the War

List of Fellows of the American Academy of Pediatrics who have been promoted since entering the Military Services:

Army

Major Robert A. Bier, Washington, D. C., to Lieutenant Colonel
Captain Sidney Blumenthal, New York, to Major
Major W. W. Briant, Jr., Pittsburgh, to Lieutenant Colonel
Captain Frank J. Jacobson, Providence, R. I., to Major
Major Paul Harper, Bridgeport, Conn., to Lieutenant Colonel
Captain George Heller, Englewood, N. J., to Major
Captain Albert F. Stein, Chicago, to Major
Major Robert O. Y. Warren, Wilmington, Del., to Lieutenant Colonel

Navy

Lieutenant Commander Jack E. Strange, New Orleans, to Commander

News and Notes

The following were certified by the *American Board of Pediatrics* following examinations in San Francisco, May 6 and 7, 1944:

Robert Hamilton Alway, Salt Lake City, Utah
John Francis Belz, Portland, Ore.
Charles Henry Cutler, San Francisco, Calif. (Now in Army)
Carl A. Erickson, Pasadena, Calif.
David M. Goldstein, San Luis Obispo, Calif. (Now in Army)
May B. Guy, Seattle, Wash.
Paul Herzog, Kenosha, Wis. (Now in Army)
Arthur Henry Hurd, Pasadena, Calif.
Helen Marie Johnson, San Francisco, Calif.
Evelynne Gwenneth Knouf, San Marino, Calif.
Donald C. Marshall, Honolulu, T. H.
Ann Lavinia Martin, Colorado Springs, Colo.
Mary B. Olney, San Francisco, Calif.
Leonard Bolton Outlar, Wharton, Texas (Now in Navy)
Agnes Groves Plate, San Francisco, Calif.
Frederick W. Rutherford, Seattle, Wash.
Milton C. F. Semoff, Albuquerque, N. M.

Spencer Snow, Salt Lake City, Utah
William Herman Zavin, Portland, Ore.

Of thirty-one applicants examined at this meeting nineteen passed and twelve failed.

The third edition of the *Directory of Medical Specialists* listing names and biographic data of all men certified by the fifteen American Boards is to be published early in 1945. Collection of biographic data of the Diplomates certified since the 1942 edition and revision of the older listings in that volume are now going forward rapidly. Diplomates are requested to make prompt return of notices regarding their biographies as soon as possible after receiving the proper forms from the publication office soon to be mailed to them.

The American Board of Pediatrics has had to change the date of the examination next fall in New York due to hotel facilities. The following schedule has been announced:

Written examination for all candidates planning to take the fall oral examinations: Friday, September 22, 1944, locally under Monitors.

Oral examinations: St. Louis, Mo., Nov. 8 and 9, 1944; New York, N. Y., Dec. 15 and 16, 1944.

Group I, which requires that an applicant shall have been specializing in pediatrics for ten years or more, will be abolished on July 1, 1944. All applicants regardless of qualifications must take both the written and oral examinations.